Reference
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DEPARTMENT OF THE ARMY FIELD MANUAL

INFANTRY DIVISION ENGINEERS

HEADQUARTERS, DEPARTMENT OF THE ARMY

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INFANTRY DIVISION ENGINEERS

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This manual supersedes FM 5-132, 23 August 1957.

PART ONE

INTRODUCTION

1. Purpose and Scope

a. This manual is a guide for the battalion commander, company commanders, platoon leaders, and squad leaders in the organization and operations of the infantry division engineer battalion, its component units, and the battle group engineer platoon.

b. It also contains information for the commander and staff officers of the infantry division on the tactical employment of the infantry division engineers.

2. Specific Coverage

a. The manual covers the organization, missions, capabilities, training, employment, and normal operations of the infantry division engineer battalion and its components. It also covers the mission, organization, equipment, capabilities, and employment of the battle group engineer platoon.

b. It lists the major items of equipment of the engineer battalion and the battle group engineer platoon.

c. Duties of the battalion commander and his staff are discussed in the manual. Duties of other personnel are not discussed unless they vary from the duties listed in SR 605–105–5, for officers; and AR 611–201, for enlisted men.

d. The discussions of missions, organization, personnel, and equipment are based on the latest issues of tables of organization and equipment (TOE's) at the time the manual was written.

e. The material presented herein is applicable, without modification, to nuclear and nonnuclear warfare.

PART TWO

ORGANIZATION

CHAPTER 1

INFANTRY DIVISION ENGINEER BATTALION

3. Organization and Mission

The infantry division engineer battalion is organized under TOE 5–15 into a headquarters and headquarters company and five identical engineer companies (fig. 1). Its mission is to increase the combat effectiveness of the infantry division, to which it is organic, and to carry out infantry-type combat missions.

4. Capabilities

The battalion has equipment and trained personnel to give the following engineer support to the infantry division:

a. Engineer staff planning and supervision for organic and supporting engineer troops.

b. Giving technical advice to supported organizations on engineering matters. This includes recommendations for employment of engineer troops.

c. Constructing, repairing, and maintaining roads, bridges, ferries, fords, and culverts.

d. Supporting hasty stream crossings with its own equipment and personnel; and, in deliberate river crossings, coordinating organic and supporting engineer equipment and troops.

e. Providing fixed bridges for crossing short gaps.

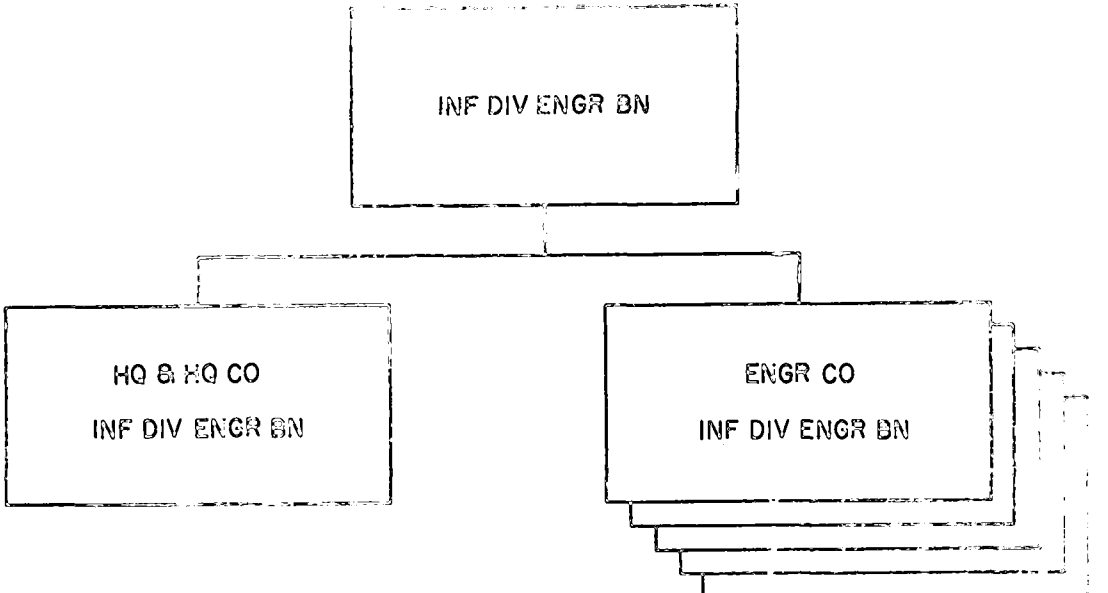

Figure 1. Organization chart, infantry division engineer battalion.

f. Helping emplace and remove obstacles, including mines and boobytraps.

g. Preparing and executing demolitions. This includes the employment of atomic demolition munitions.

h. General construction, which includes landing strips.

i. Assisting in assaults on fortified positions.

j. Supplying maps.

k. Constructing and placing deceptive devices.

l. Performing engineer reconnaissance and intelligence functions.

m. Giving technical assistance to other troops in preparing fortifications and camouflage.

n. Providing engineer class II and class IV supplies.

o. Providing engineer third echelon field maintenance support.

p. Purifying and supplying water.

q. Engaging in infantry-type combat.

5. Major Items of Equipment

The infantry division engineer battalion contains the following major items of equipment:

a. Assault boats.

b. Armored vehicle launched bridges.

c. Two light tactical raft sets.

d. Crane-shovels.

e. Road graders.

f. Scoop loaders.

g. Air compressors and pneumatic tools.

h. Chain saws.

i. Mine scoops.

j. Medium tractors, with dozer blades.

k. Water purification sets.

l. Carpenter and pioneer tool kits.

m. Combat engineer vehicles (the M-48 tank, with dozer blade attached, is being used as a substitute item until the combat engineer vehicle is available.)

n. Dump trucks.

6. Mobility

The infantry division engineer battalion and all its component units are 100 percent mobile with organic transportation.

CHAPTER 2

BATTALION HEADQUARTERS

7. Organization and Mission

Battalion headquarters (fig. 2) is organized under TOE 5–16 into command elements, organizational staff elements, and special staff elements. Its mission is to provide command and staff supervisory personnel for administration, communication, reconnaissance, medical services, and supply for the battalion and to provide engineer class II and class IV supply and engineer field maintenance support to the division.

8. Capabilities

The infantry division engineer battalion headquarters is capable of the following:

a. Engineer staff planning and supervision for organic and attached engineer troops.

b. Giving technical advice on engineering matters to supported organizations.

c. Procuring maps and distributing them to the division.

d. Engineer reconnaissance and intelligence functions.

e. Furnishing engineer class II and class IV supplies to the division.

f. Engineer third echelon field maintenance support to the division.

g. Providing potable water for the division.

9. Duties of Personnel

a. Battalion Commander. The battalion commander

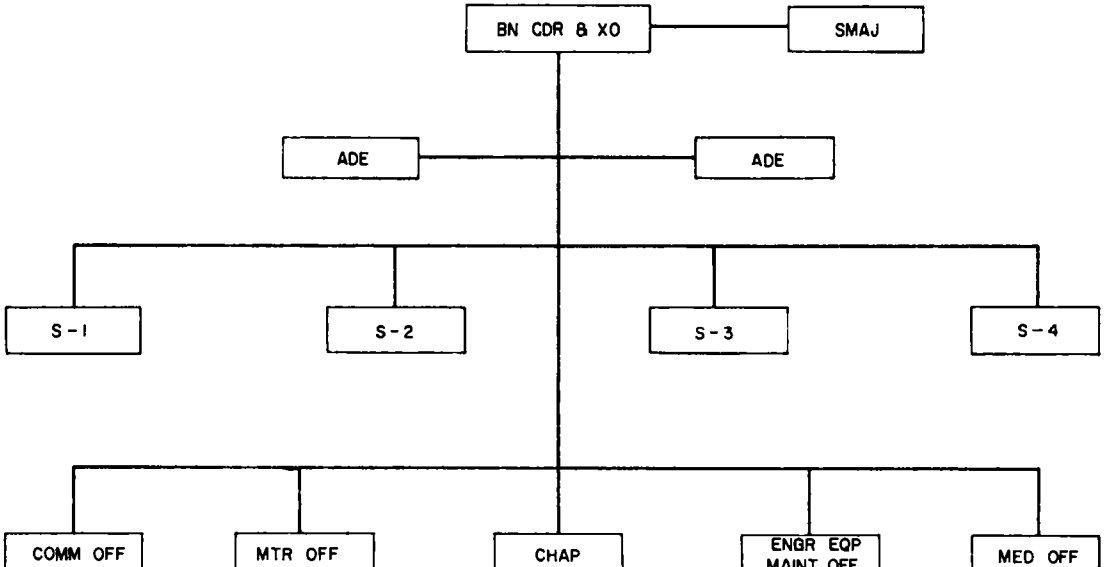

Figure 2. Organization chart, battalion staff.

has two separate responsibilities. He commands the infantry division engineer battalion; and he is a member of the division commander's special staff as division engineer. As battalion commander, he directs the operations of the battalion in implementing its assigned engineer missions. As division engineer he performs the following engineer duties:

(1) He makes recommendations to the division commander on the employment of engineer troops and equipment. This includes recommendations for engineer troop support of divisional elements.

(2) He makes recommendations to the division commander on the requirements for engineer materials for the division; and he supplies these materials to the division.

(3) He advises the division commander on engineer plans, on barrier plans, and on engineer recommendations for river-crossing operations.

(4) He makes recommendations to the division commander on mine warfare, on demolition operations, and on construction and removal of obstacles.

(5) He makes recommendations to the division commander on the traffic circulation plan and the main supply route (MSR) and on road and bridge traffic regulations.

(6) He is responsible for preparing traffic signs for routes and bridges; and he makes recommendations to the division commander on posting the signs.

(7) He is responsible for supplying maps to the division.

(8) He is responsible for supplying potable water to the division.

(9) He is responsible for the construction, repair, and maintenance of roads, bridges, and landing strips and for the engineer portion of all types of river crossings.

(10) He is responsible for any defense works which are not assigned to other troops.

(11) He is responsible for collecting, evaluating, and disseminating information on enemy engineer materiel and activities.

(12) He is responsible for engineer reconnaissance and for preparing terrain estimates.

(13) He is responsible for engineer third echelon maintenance, for all engineer equipment within the division.

(14) Within the limits prescribed by the division commander, he supervises engineer and camouflage activities of divisional units.

(15) Upon the division commander's decision to employ atomic demolition munitions, the division engineer designates the emplacing and firing unit; coordinates on supply and on moving equipment, materials, and personnel to support the mission; and furnishes the commander technical information on the following:

(*a*) Quantity, types, and yield of weapons.

(*b*) Height or depth of burst.

(*c*) Emplacement site.

(*d*) On-call detonation or time of burst.

(*e*) Troop and civilian safety precautions.
(*f*) Special equipment needed.

b. Staff.

(1) *Executive officer.* The executive officer is second in command. He supervises the staff; and he controls and coordinates staff activities in accordance with the orders and policies of the battalion commander.

(2) *Assistant division engineer (ADE).* There are two assistant division engineers on the battalion commander's staff. They represent the division engineer at the division staff and brigade headquarters and are authorized to make decisions for him in his absence. They are responsible for keeping the division situation maps at division and brigade headquarters accurate and up to date. They keep the engineer battalion commander and staff informed on the activities and plans of the division and brigade headquarters; and they keep the division and brigade informed on activities of the battalion.

(3) *Adjutant (S1).* The adjutant handles the battalion personnel and administrative matters. These matters include pay records, promotions, assignments, transfers, awards, leaves, courts-martial, casualties, the battalion journal, routine orders, and the publication and authentication of all orders and instructions of the commander except combat orders and certain technical instructions. The adjutant also supervises athletics, entertainment, and other morale-building activities

when no other officer is designated for these duties.

(4) *Intelligence officer (S2).* The intelligence officer is charged with the responsibility of collecting, evaluating, and disseminating engineer information. He keeps the S2 situation map, trains others in intelligence work, and is responsible for engineer and combat intelligence for the organization. He is responsible for map procurement and distribution. He acts as the division map supply officer under the supervision of the division G2, in accordance with the policies of the division commander. He is assisted by three reconnaissance officers who work within the S2 section. They supervise reconnaissance operations and personally participate in reconnaissance missions. Although the reconnaissance officers are assigned to the S2 section, they perform reconnaissance missions for the entire organization.

(5) *Operations and training officer (S3).* The operations and training officer directs the activities of the operations and training section. He plans battalion training and assists in its supervision. He plans allocations of engineer troops and construction equipment to various tasks, prepares battalion operation orders, arranges details for movement of the battalion under tactical conditions, and prepares plans and designs for accomplishing engineer tasks. He assists in preparing recommendations on traffic circu-

lation, recommends security measures for battalion headquarters, keeps the engineer operations situation map, and prepares tactical and technical reports as directed.

(6) *Supply officer (S4).* The S4 is the division engineer supply officer. He effects pickup at army depots or army supply points and issues to units of the division the engineer class II and class IV items they need, except fortification and construction materials. The S4 coordinates and supervises the supply of fortification and construction materials for the division. He supervises the supply section of the battalion and is responsible for its functioning. He keeps in close touch with S2 and S3, with the tactical situation, with the division G4, and with all supply installations.

(7) *Communication officer.* The communication officer advises the commander on matters of signal communication technique. He makes plans and recommendations for the engineer communication system; and he establishes, operates, and maintains it. He supervises and instructs communication center personnel in the function of a message center. He gives technical assistance to S4 on supply of signal communication material. If the initial and successive locations of the battalion command post (CP) are not prescribed by higher authority, he makes recommendations for them. He supervises technical training of communication personnel in the battalion.

(8) *Motor officer.* The battalion motor officer supervises the battalion maintenance section. He advises the commander, staff, and subordinate commanders within the engineer battalion on the technical aspects of vehicle and equipment operations and maintenance. In coordination with S3, he directs training for drivers, mechanics, and operators.

(9) *Engineer equipment maintenance officer.* The battalion engineer equipment maintenance officer executes the division engineers responsibilities for third echelon maintenance activities for the division. He supervises the training, operations, and supply activities of the engineer field maintenance section of the battalion. He advises commanders of divisional units and their staffs on the technical aspects of engineer equipment maintenance and operation and on the training of equipment operators.

(10) *Chaplain.* The chaplain is adviser to the battalion commander and staff on all matters pertaining to religion, welfare, and morale activities of the command. He conducts religious services, including funerals. He corresponds with relatives of deceased personnel, coordinates the religious work of various welfare societies, prepares reports on religious and morale activities of the command, and prepares estimates of funds for religious activities which are not specifically charged to other agencies of the command.

(11) *Medical officer.* The medical officer supervises the medical services of the battalion. He serves as adviser to the battalion commander and staff on matters affecting the health of the command and the sanitation of the battalion area. Specifically, he instructs battalion personnel in personal hygiene, military sanitation, and first aid, makes medical and sanitary inspections; establishes and operates the battalion first aid station and dispensary; requisitions medical equipment and supplies for the battalion; prepares the battalion medical plan; supervises collection and evacuation of wounded; and supervises the preparation of casualty lists and other records pertaining to the medical service.

c. *Staff Relationship.* The battalion commander must organize his staff so that staff functions operate efficiently. Figure 3 gives one such method of organization.

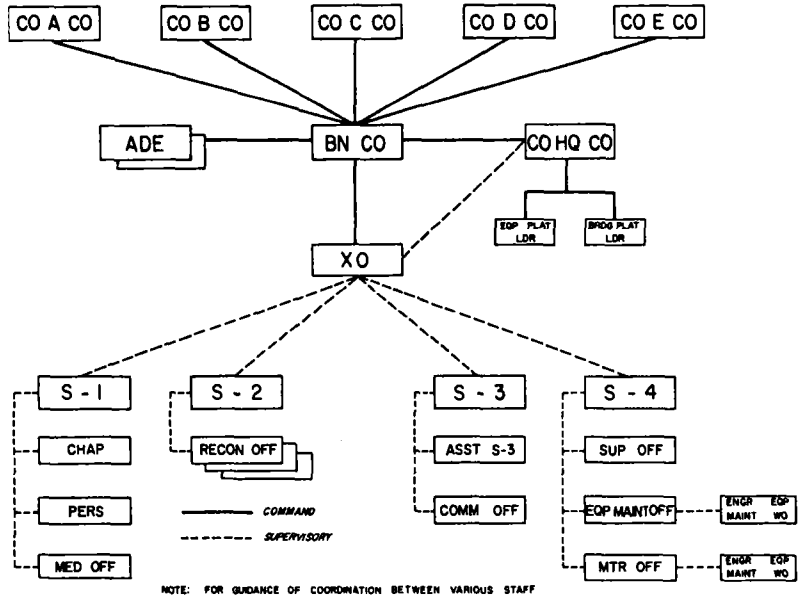

Figure 3. Command and staff relationship.

CHAPTER 3

HEADQUARTERS COMPANY

10. Organization and Mission

The headquarters company of the engineer battalion is organized under TOE 5–16. It is composed (fig. 4) of the company officers and the enlisted men who work in battalion staff sections, in company headquarters, and in the two operating platoons: the bridge platoon and the equipment platoon. The mission of headquarters company is to provide company-level administration and administrative support for battalion headquarters and to provide to elements of the battalion certain specialized equipment. It also engages in infantry-type combat when necessary.

11. Capabilities

The headquarters company is capable of the following:

a. Furnishing supplemental construction equipment and operators to elements of the battalion.

b. Furnishing combat engineer vehicles (fig. 5) to elements of the battalion.

c. Furnishing short-gap fixed bridging and light stream-crossing equipment to the battalion.

d. Providing personnel for battalion staff sections to perform the tasks outlined in paragraph 8.

e. Providing security for the battalion headquarters command post.

12. Company Headquarters

The company headquarters provides command and administrative services for headquarters company and

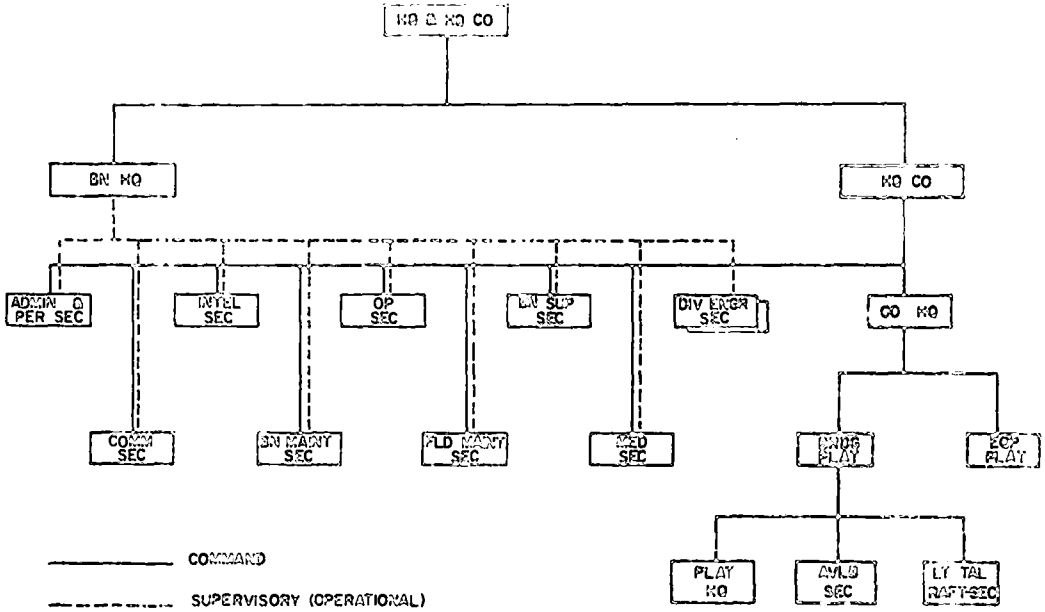

Figure 4. Organization chart, headquarters company.

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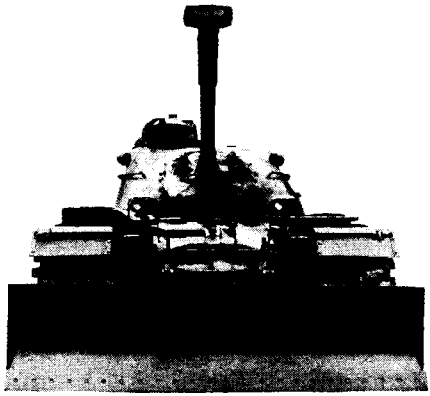
battalion headquarters. These services include mess, supply, quarters, and supervision of nonduty-hour activities.

13. Bridge Platoon

The bridge platoon consists of a platoon headquarters, an armored vehicle launched bridge section, and a light tactical raft section. It provides the



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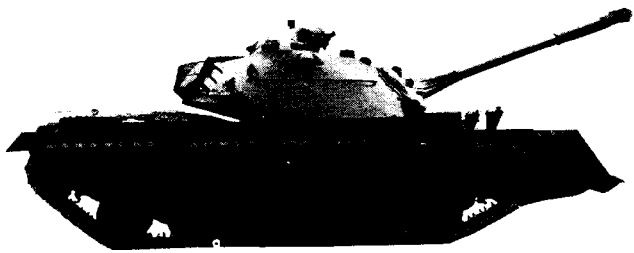

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Figure 5. M-48 tank with dozer blade.

Figure 6. Armored vehicle launched bridge being launched.

engineer companies with 60-foot-span armored vehicle launched bridges (fig. 6) for short-gap spanning, enough assault boats to cross one rifle company in the assault wave, and two light tactical raft sets for river crossings. The bridge platoon is also capable of giving technical assistance to the supported organization in the utilization of its organic equipment.

14. Equipment Platoon

a. The equipment platoon contains the following major items of equipment:

(1) Crane-shovels.
(2) Road graders.
(3) Pneumatic tools and air compressor.
(4) Mine scoops.
(5) Medium tractors, with dozer blades.
(6) Combat engineer vehicles.
(7) Dump trucks.

b. This equipment and the trained operators make the platoon capable of furnishing the engineer companies equipment for the construction, maintenance, and repair of routes of communication, landing strips, obstacles, and field fortifications. The platoon is also capable of giving technical assistance to the supported unit in the use of the equipment, assisting the headquarters company in planning and directing the employment of platoon equipment, and providing combat engineer vehicle assault support.

CHAPTER 4

ENGINEER COMPANY, INFANTRY DIVISION ENGINEER BATTALION

15. Organization and Mission

The engineer company is the basic administrative unit of the infantry division engineer battalion. It is organized under TOE 5–17 into a company headquarters and two identical engineer platoons, each with a platoon headquarters and three identical operating squads (fig. 7). It is equipped to perform combat engineer tasks; and, when reinforced with additional heavy equipment, it can perform more complex engineer work. It provides normal engineer support for a battle group; and it engages in infantry-type combat when required.

16. Major Items of Equipment

The equipment in company headquarters includes pneumatic reconnaissance boats, mine scoop, pneumatic tool and compressor outfit, and a medium tractor with angle dozer blade. The equipment in platoon headquarters includes carpenter and pioneer tool kits, a portable electric pioneer outfit, a wheeled scoop 4-in-1 bucket loader, a demolition set, and a dump truck. Each squad contains carpenter and pioneer tool kits, chain saw, demolition set, and a dump truck.

17. Capabilities

a. The engineer company is capable of the following:

(1) Constructing, repairing, and maintaining roads, bridges, ferries, fords, and culverts.

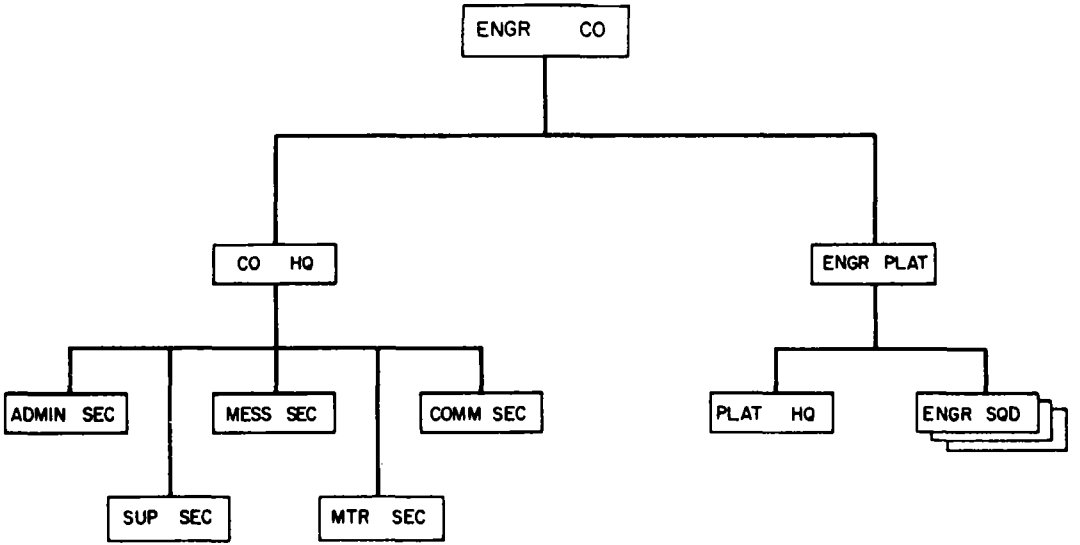


Figure 7. Organization chart, engineer company.

(2) Assisting in emplacing and removing obstacles, including mines and boobytraps.
(3) Preparing and executing demolitions, including atomic demolition munitions.
(4) Assisting other troops prepare fortifications and camouflage.
(5) Conducting engineer reconnaissance.
(6) Constructing and emplacing deceptive devices.
(7) Giving technical advice to supported organizations on engineer matters. This includes recommendations for employment of engineer troops.
(8) Assisting in assaults on fortified positions.

b. When supported by elements from headquarters and headquarters company, the engineer company is capable of the following:

(1) Providing raft and assault-boat support for stream-crossing operations.
(2) Furnishing fixed bridges for crossing short gaps.
(3) General construction, including construction of landing strips.
(4) Water purification and supply.

18. Platoon

The mission of the platoon is to perform combat engineer tasks that increase the combat effectiveness of supported units. It is the basic operating component of the engineer company. It is capable of engineer reconnaissance; constructing, maintaining, and repairing fords and roads; constructing, repairing, strengthening, and maintaining bridges and bypasses; removing, neutralizing, or destroying manmade and natural obstacles (fig. 8), including minefields; and giving

Figure 9. Engineers constructing a barbed wire fence.

technical assistance to other troops in preparing obstacles and barriers (figs. 9 and 10).

19. Squad

The squad is the basic operating and working unit of the platoon. The mission of the squad is to perform minor combat engineer tasks. It consists of specialists in combat construction and demolition, to include pioneers who are trained to assist in accomplishing combat engineer tasks. The equipment of the squad matches the specialties of the individuals.

Figure 10. Engineers preparing a roadblock.

PART THREE

OPERATIONS

CHAPTER 5

INFANTRY DIVISION

20. Characteristics

The infantry division is one of the large units of the combined arms and services. It is the basic unit to engage in land combat. Its mission is to destroy, defeat, or repel the enemy by aggressive offensive action. To achieve its mission, it employs nuclear and nonnuclear fire, maneuver, and close combat. It may be employed as part of a land force of army groups, armies, and corps; in independent or joint operations of no more than corps size; or in small combined operations with allied forces. The infantry division can be stationed worldwide or moved, on short notice, to any threatened spot. It can apply the degree of force required by situations ranging from a show of force to total nuclear war. Flexibility, dispersion, and rapid concentration are characteristics of its operations. These characteristics enable it to conduct all types of ground operations under varying conditions of weather and terrain, either as an independent organization, with appropriate attachments, or as part of a larger force, with or without the support of nuclear weapons. For detailed information on the infantry division, see FM 7-100.

21. The Battle Group

The battle group normally is employed as an organic

element of the infantry division (FM 7–40). Its mission is to close with the enemy by fire and maneuver in order to capture or destroy him or to deny the enemy a vital area, to contain his forces, or to effect maximum casualties and disorganization before taking offensive action. Battle group task forces may be formed by the attachment of other units, including engineer units. The composition of such task forces can be designed to meet the needs of specific tactical situations.

a. Battle Group Task Force. A battle group task force is built around one infantry battle group. It normally has one engineer company in support. The infantry division engineer battalion provides this company.

b. Smaller Task Forces. Task forces of less than battle group size vary in size from two or more infantry companies to one infantry platoon (FM 7–10). Their assigned tasks and the engineer effort required are so varied that many combinations of infantry-engineer units are possible.

22. Engineer Support

The battle group has organic engineer capability—an engineer platoon, which is part of headquarters company. However, most operations require additional engineer support, which is provided by the infantry division engineer battalion and distributed among the divisional components on the basis of one engineer company per committed battle group. The remaining engineer companies perform general task assignments for the division as a whole. Engineers provide support in one of the following three ways:

a. General Support. General support is the normal engineer support provided in the division area of responsibility. The battalion commander assigns the line companies projects, which they carry out on an area or a task basis. He establishes his requirements by operational plans, unit requests, and normal engineer reconnaissance. The engineer battalion commander retains full control of the battalion. The divisional units submit their requests for engineer support to the battalion operations and training officer (S3).

b. Direct Support. Direct support is the engineer effort devoted entirely to assisting a single divisional unit, such as an infantry battle group. The battalion commander still maintains control of the battalion. However, there is close liaison between the supported and supporting units.

c. Attachment. Attachment is the engineer support to a specific infantry unit which is controlled by the commanding officer of the supported unit. This transfer of the command over to the infantry commander is necessary during the formation of task forces, covering forces, and other situations which require the removal of various units beyond the effective control of their parent units. Along with the assumption of command over the supporting unit, the supported infantry commander accepts full responsibility for it. The attachment may be qualified by stating that one unit is attached to another "for supply" or "for rations". Unless the attachment is qualified, it is attached for all purposes except such personnel matters as transfers and promotions.

CHAPTER 6

INFANTRY DIVISION ENGINEER BATTALION

Section I. ADMINISTRATION

23. General

a. The application of sound principles of personnel management is essential to the efficient operations of the battalion and companies. By careful selection of individuals to fill positions in the battalion and companies, the commanders can reduce the amount of time necessary for the supervision of administrative matters, allowing themselves more time for the supervision of combat operations.

b. The battalion adjutant must keep the battalion commander informed concerning the personnel policies of higher headquarters. He must advise the commander in the formulation of all battalion policies which affect personnel; and he must keep the commander informed of the effect of such policies on individual and team proficiency, morale, discipline, and esprit de corps within the battalion.

c. The battalion adjutant, by applying the principle of centralized functions, can relieve the company commanders of most of their administrative and personnel duties. The personnel section is the proper agency to perform these functions. The company commanders, if relieved of these administrative duties, can devote a greater amount of time to the training and tactical employment of their units.

d. When the division is committed to combat, the battalion personnel section is placed under the control

of the administrative service company and under the technical supervision of the division adjutant general. Information to the battalion personnel section for the accomplishment of its mission is relayed to it through the battalion adjutant, except for those units on attached status who will relay through the adjutant of the supported unit.

e. The procedures described in this section are intended as a guide and are subject to modification by appropriate regulations, directions, and policies of higher headquarters.

24. Strength Records and Reports

a. The companies informally furnish the battalion personnel officer with necessary information for the company morning report. The company morning report is then prepared by the battalion personnel section and signed by the personnel officer. A file copy of the morning report is furnished to the company.

b. The companies also submit to the battalion adjutant a personnel daily summary report and, as required, a casualty or nonbattle loss status report.

25. Morale and Personnel Services

The company commander is responsible for the morale and welfare of members of the company. His specific responsibilities are as follows:

a. He insures that leave and rest quotas are equitably allocated and that these quotas are filled when conditions permit. Emergency leaves are processed expeditiously in accordance with regulations and policies.

b. He insures that all personnel are familiar with decoration policies and that draft recommendations are

promptly forwarded to battalion for preparation in final form.

c. He insures that mail is promptly delivered and properly handled (AR 65–75).

d. He insures that services such as legal assistance, welfare, army exchange, special services, and chaplain's assistance are made available and are properly utilized.

26. Replacements

Replacements are requisitioned by the battalion adjutant, based on vacancies existing in the companies. Upon receipt of replacements, the company commander insures that they are properly welcomed, oriented, and assigned.

27. Discipline, Law, and Order

a. Since discipline is the mental attitude and state of training which renders obedience and proper conduct instinctive under all conditions, it is evident that training within the unit must be pointed toward the development of moral responsibility within each individual. When such training is adequate and effective, problems of law and order diminish. Preventive measures are much more effective than corrective action. By exercising sound leadership, and by requiring that subordinate commanders do likewise, the unit commander builds good discipline. Good discipline forestalls many problems of law and order.

b. The company commander is responsible for all matter pertaining to discipline, law, and order within the company. When appropriate, he exercises jurisdiction under article 15, UCMJ, or prefers charges. Charge sheets and allied papers are normally prepared

by clerks of the battalion S1 section from information furnished by the company commander.

c. The battalion commander exercises summary and special court-martial jurisdiction. He insures the appointment of court-martial boards for prompt disposition of cases occurring within the organization and for the efficient administrative processing of charges and proceedings.

d. The battalion adjutant maintains statistics on all absences-without-leave, stragglers, rewards and punishments, court-martial actions, and other matters reflecting the status of discipline and law and order within the command. He maintains records to insure that corrective action is taken when required.

28. Prisoners of War

a. The company commander is responsible for the proper handling of prisoners of war in accordance with the Geneva Convention of 1949 and for their evacuation to battalion headquarters or to headquarters of the supported organization.

b. The adjutant prepares and supervises the execution of plans for the collection and evacuation of enemy prisoners of war. He must be careful to insure that these plans conform to the directives of higher headquarters and that they are sufficiently comprehensive. He coordinates with S2 for estimates on prisoners anticipated and facilities for any interrogation desired, and with S3 for necessary guards for prisoners while they are being evacuated. He coordinates with S4 for transportation to evacuate enemy prisoners of war and with the battalion surgeon for evacuation of wounded prisoners.

29. Recovery and Disposition

The company commander is responsible for collecting, identifying, and evacuating the dead, and for safeguarding their personal effects, while in the area of his control. Deceased personnel are normally evacuated to the battalion or supported organization's recovery and disposition point on available transportation. Personal effects are not removed from the body.

30. Civil Affairs

a. The battalion adjutant coordinates the activities of any civil affairs teams attached to or operating with the battalion. In the event no such teams are available, the adjutant normally performs their functions. In either case, the adjutant must be thoroughly familiar with policies and directives of higher headquarters concerning civil affairs operations. The primary mission of civil affairs during combat is to assist military operations by providing civilian labor, local supplies, buildings, public utilities, and control of refugees. In connection with civil affairs, the adjutant must coordinate with S3 on security measures and on use of troops.

b. The company commander executes such civil affairs responsibilities as may be delegated by higher headquarters. He also insures that the utilization of civilians by his unit conforms to directives of higher headquarters.

Section II. INTELLIGENCE

31. General

The battalion commander has three basic intelligence responsibilities: to division, to technical channels, and

to the battalion and its subordinate and supporting units. The battalion intelligence officer (S2) assists the commander in these responsibilities.

32. Responsibility to Division

a. The division engineer furnishes timely intelligence information to the division on terrain; minefields and obstacles; effects of weather; effects of nuclear detonation on the terrain; enemy fortifications; enemy engineer troops, their capabilities, equipment, materiel and techniques; routes of communication; and sources of usable engineer supplies and equipment.

b. The division engineer works closely with the G2 in the preparation of the intelligence estimates and the intelligence annexes (FM 30–5). Spot reports on enemy engineer materiel should be disseminated through the G2 to the units of the division as quickly as possible. The supply of maps to the division is a responsibility of the division engineer, and he should have a close-knit relationship with the G2 on this function, particularly in regards to future operations so that a timely map coverage may be provided.

c. The division engineer assists the G3 in the preparation of the operation orders on matters pertaining to engineer intelligence such as in the engineer and barrier annexes.

33. Technical Channel Responsibilities

a. Engineer technical channel responsibilities deals with the principles of design and operation, nomenclature, physical characteristics, performance, operational capabilities, and limitations of foreign material and facilities used by or for the support of military forces. In a broader sense, this responsibility may also

embrace the manufacture, storage, installation, maintenance, and operating aspects of foreign materiel and facilities, including the effects of weather, terrain, and military action thereon, as the nature, organization, and activities of foreign military engineer organizations having functions similar to those of the United States Army. For further information, see FM 30–16.

b. The duties of the division engineer relative to his engineer technical channel responsibilities are to—

(1) Supervise all phases of this intelligence activity within the division.

(2) Know the technical aspects of foreign materiel for which the engineer has primary responsibility.

(3) Collect, examine, and report on captured engineer enemy materiel and documents to include possible tactical capabilities, limitations, counterweapons, and countertactics.

(4) Implement and operate the system of evacuation of captured engineer materiel.

(5) Coordinate with other services on exploitation of materiel of interest to more than one of the technical services.

(6) Forward reports on processing of materiel and information derived therefrom through engineer intelligence and technical channels.

(7) Provide, within the engineer field of interest, information to instruct troops on foreign materiel to include recognition, characteristics, use, and interchangeability with United States or allied equipment.

34. Responsibility to the Battalion

The division engineer as the battalion commander,

and assisted by the battalion S2, directs the intelligence activities of the battalion (FM 5–30). These functions are—

a. Disseminating all intelligence information to subordinate and supporting units.

b. Preparing terrain analyses and studies for use of the battalion.

c. Supervising intelligence training.

35. Timing

Engineer intelligence must be placed in the hands of those agencies (troop commanders or staff sections) which need it, in time to permit them to make practical use of it in their planning and operations. Disseminating agencies must allow both for time of physical transmission and for time to clear intermediate headquarters before the item of intelligence reaches the ultimate user. This is especially important in the case of dissemination downward; it is also important, in a fast-moving situation, with respect to dissemination in any direction. In urgent cases, partial or fragmentary reports may be sent; summaries may be sent by wire or radio, in advance of a complete report; or incompletely processed intelligence may be disseminated, with a precautionary note incorporated into the text of the report.

36. Sources of Engineer Information

a. In general terms, the division engineer obtains engineer information in three ways: by the study of documents, to include the interpretation of photographs; by reconnaissance agencies; and by interrogation of individuals. More specifically the sources

are as listed below. Of those listed, photographs will probably be the primary source of engineer information.

(1) Aerial and ground reconnaissance.
(2) Aerial and ground photographs.
(3) Maps.
(4) Prisoners of war.
(5) Refugees.
(6) Local civilians.
(7) Captured enemy materiel.
(8) Captured enemy installations.
(9) Captured enemy documents.
(10) Other documents, including texts, periodicals, and technical papers.
(11) Intelligence publications (including terrain and weather studies).

b. These sources are available to, and used by, the engineers of commands at all levels, but in varying proportions. At divisional level, ground and short-range aerial reconnaissance and reports from other frontline troops, supplemented by data from local intelligence sources such as prisoner-of-war statements, are of vital importance in bringing up to date the available intelligence on terrain and enemy installations. In a fast-moving situation they may be the only sources of such intelligence.

37. Terrain and Weather Studies

a. The most effective employment of military forces requires consideration of the influence of weather and terrain from the inception of a plan through its final execution. Accurate interpretation of the effects of weather and terrain serves not only as a basis for increasing the probability of success in operations, but serves also as a basis for determining probable enemy

courses of action. The object of the study of the area of operations is to determine the effect of the terrain and weather upon the mission and upon the capabilities of the enemy. This deduction is based on the critical terrain features within the area and the best avenues of approach to them. The effect of the area on the capabilities of the enemy frequently assists in eliminating those capabilities not favored by conditions of terrain and weather. For detailed information on terrain intelligence, see FM 30–10.

b. A terrain analysis is an evaluation of a piece of terrain in the light of its five military aspects. The following is proposed as a guide for a terrain analysis:

(1) Critical terrain features.
(2) Observation and fields of fire.
(3) Cover and concealment.
(4) Obstacles.
(5) Avenues of approach.

c. All commanders must make a constant, never-ending study of the weather and terrain in their area of operations. Normally, the intelligence officer conveys his information of the weather and terrain to his commander by means of the intelligence estimate. The intelligence estimate is incorporated in the commander's estimate of the situation.

d. The engineer, under the staff supervision of G2, is responsible for the production and maintenance of terrain studies based on technical analysis. These studies are either basic or interpretive. Basic studies emphasize the natural factors such as relief and drainage, vegetation, and soils. Analyses of these result in interpretative studies which indicate the suitability of the terrain for military operations such

as trafficability. Engineer terrain studies generally take the form of overprinted maps or overlays on which the various terrain characteristics are emphasized. The graphic description of terrain may, however, be supplemented by verbal summary. The studies that are more or less standard include: relief (plastic relief and layer tinting), cross-country movement, vegetation, routes of communication, drainage, surface materials, cover and fields of fire, and concealment and observation.

e. Weather forecasts originate at corps or higher headquarters and are disseminated through intelligence channels. Weather forecasts covering periods ranging from less than 12 hours to more than 3 days can be obtained, and in some instances climatological studies may be of use.

f. Weather and climate exert significant effects on personnel, equipment and supplies, and on terrain, i.e., soil trafficability, width of streams, etc., on manmade features, and on the activities of tactical forces. The most important weather elements and some of the effects on military operations are—

(1) *Precipitation.* Precipitation materially affects trafficability and the extent of water obstacles; restricts visibility and reduces the efficiency of listening posts and sound ranging equipment.

(2) *Fog.* Fog affects visibility and concealment from ground and aerial observation. Conditions of poor visibility may favor the attacker by enabling him to close with the enemy unobserved. Good visibility normally favors the defender by allowing him to observe the approach of the attacker.

(3) *Temperature.* Temperature affects the operating efficiency of both personnel and equipment. Alternate freezing and thawing affects trafficability and the extent of water obstacles.

(4) *Wind.* Wind affects airborne operations, use of CBR, accuracy of artillery fire, drying of wet ground, and the degree of cold at which humans can survive.

(5) *Cloud cover.* Cloud cover limits air operations. Usually works to the disadvantage of the force having air superiority. Acts as a reflector when searchlights are used for battlefield illumination at night.

(6) *Light data.* Light data includes time of sunrise, sunset, moonrise, moonset, periods of civil, nautical, and astronomical twilight. Nautical twilight is useful for military operations by providing a specific time for the commencement of military operations.

(7) *Effects of weather on ADM employment.* ADM (atomic demolition munitions) employment is basically the detonation of a surface or subsurface atomic explosion. An ADM would not be employed when friendly troops might be affected by radioactive fallout due to wind direction or residual radiation.

38. Reconnaissance

a. Reconnaissance and Counterreconnaissance. All units have reconnaissance and counterreconnaissance responsibilities. Reconnaissance and counterreconnaissance cannot be readily separated. Effective reconnaissance helps insure security. Counterreconnaissance activities also provide reconnaissance infor-

mation. Forces executing reconnaissance missions may be employed simultaneously on counterreconnaissance. However, the order to the force must state which mission has priority. In a force of sufficient size, a part of the force may be assigned each task.

b. Mission of Reconnaissance. Reconnaissance is a mission undertaken to obtain, through observation, information about the activities and resources of an enemy or potential enemy, and data concerning the physical characteristics of a particular area. Observation includes use of sensory devices. Reconnaissance does not include espionage. Reconnaissance missions will, at times, require combat operations.

c. Mission of Counterreconnaissance. Counterreconnaissance operations are measures taken to prevent or reduce the effectiveness of hostile observation of a force, area, or place. Counterreconnaissance is supplemented by counterintelligence measures. Counterreconnaissance becomes more difficult as dispersion of units increases.

d. Responsibility of Division Engineer. The division engineer is responsible for the reconnaissance needed by his command. He normally delegates to his intelligence officer the planning and direction of the work.

(1) *Battalion.* The battalion S2 has three reconnaissance officers, who each commands a reconnaissance team, to assist him in performing battalion reconnaissance missions (FM 5–36).

(2) *Company.* The company commander directs continual general engineer reconnaissance; and he directs specific reconnaissance missions

to obtain information for the battalion commander on a special subject or for a special purpose. The company commander directs the formation and operation of reconnaissance patrols requested by the battalion and by the supported infantry battle group. These patrols are usually composed of platoons, squads, or selected groups of men under company officers or noncommissioned officers (NCO's). The particular reconnaissance mission determines the composition of the patrols.

(3) *Platoon.* The company commander may require the platoon to operate engineer reconnaissance patrols; but these patrols are normally of squad size and the platoon leader assigns the mission to a squad. The patrols search in designated areas for specific information and items. The engineer battalion develops a standing operating procedure (SOP) for the platoon's engineer reconnaissance. The platoon follows the SOP when the company commander has not assigned a specific platoon mission.

(4) *Squad.* Members of the squad conduct reconnaissance singly, in pairs, in small groups, and in squad formations. They usually make their searches in vehicles; but they may make them on foot. The squad leader or assistant squad leader usually makes the search. He is assisted by as many squad members as are necessary for security. The squad leader usually takes with him a combat construction specialist, who aids in bridge

reconnaissance; the demolition specialists, who aid in demolition reconnaissance; and a pioneer, who aids in reconnaissance of earth-moving and materials-handling projects. Missions requiring the entire squad are usually limited to combat reconnaissance and to the general search of an area for engineer materials. The area searched may be broken down into subareas, each covered by one or two men of the squad. Squad members constantly observe engineer intelligence items in their area of operation and report them to the squad leader.

e. Reconnaissance in Offensive Action.

(1) *During the advance.* Engineer reconnaissance during the advance is performed initially by reconnaissance teams from battalion headquarters. These teams provide the division engineer with early, reliable engineer information in the area over which the division is to advance. Routes of advance are thoroughly examined for serviceability, type, condition, location of critical points, alternate routes, mines, and condition and types of bridges. This reconnaissance will enable the teams to make an estimate of engineer work to be done and of engineer materials available. This on-the-ground reconnaissance must be supplemented by air reconnaissance, map and aerial photograph studies, and study of reconnaissance from other elements of command. It is essential that this reconnaissance be made prior to the movement, since the information

gained provides a basis for the estimate of engineer troops, supplies, and equipment necessary to support the operation and for the selection of routes and the formation of traffic circulation plans. Engineer reconnaissance elements from an engineer company may accompany the advance party of each leading battle group to provide the unit engineer with timely warning of engineer requirements to the front. Terrain which appears favorable to the advance is closely examined, especially for possible enemy use of mines, obstacles, and defending weapons.

(2) *During the attack.* Engineer reconnaissance during the attack is thorough and detailed. On the ground, personal reconnaissance is made by commanders and is supplemented by the study of maps, aerial photographs, and air and ground reconnaissance reports. Engineer companies supporting the committed battle groups make continuous reconnaissance of the routes of advance, particularly the main supply route (MSR) and the bridges, obstacles, mines, and sources of engineer materials in their assigned areas. Engineer battalion reconnaissance teams continue their general reconnaissance effort, following closely the forward engineer companies and paying careful attention to the routes of advance; the MSR; lateral roads, bridges, and obstacles; engineer material; and sites for new water points. Special reconnaissance missions are assigned by the battalion S2 as required. On

the basis of this reconnaissance information, engineer operational plans are made and means are provided to assist in maintaining the momentum of the attack.

f. Reconnaissance in Defensive Action. When the infantry division commander assigns the engineer battalion a sector for position defense, the battalion commander sends out reconnaissance teams to search the area in detail and report all items of engineer interest. He uses this information as the basis for planning obstacles in the division barrier zone; planning routes of supply, evacuation, and withdrawal; or planning denial operations. In the mobile defense, the battalion commander carries out engineer reconnaissance in conjunction with the attack. He does this either with or without reconnaissance teams. Also, in the defense, the battalion commander emphasizes route reconnaissance for counterattack forces.

g. Reconnaissance in Retrograde Movements. In a retrograde movement the engineer battalion reconnaissance teams collect advance information on roads and bridges, terrain features, installations, and resources of the territory through which the movement will take place.

39. Radiological Surveys

a. Battalion headquarters trains one control party and two survey parties. A control party consists of a variable number of individuals, depending upon the situation. A ground radiological survey party consists of a monitor and an assistant. The monitor takes instrument readings, records dose rates, time taken, and location of each reading; and transmits readings.

The assistant may be a communications adviser or a radio-telephone operator as the situation dictates.

b. The company is the basic unit for conducting radiological surveys. Each company trains and organizes a minimum of two ground radiological survey parties. Only one party at a time performs survey operations while the other party is prepared to act as a replacement. The company party is capable of surveying the company area in ½ to 1 hour. Company units report through channels, by the fastest means available, the first indication of fallout in their areas (TC 101–1).

Section III. TACTICAL EMPLOYMENT

40. Employment of Engineers

The mission of the engineer battalion is to increase the combat effectiveness of the infantry division, of which it is an organic unit, by means of general engineer work.

a. Battalion. In the attack and defense the engineer combat companies usually operate in direct or general support of the infantry battle groups. The remainder of the battalion performs missions in the division area and is prepared to reinforce the engineer companies as the division commander directs. Engineer troops are attached to nonengineer troops only when the necessary engineer assistance cannot be given by direct or general support. This gives the battalion commander proper control of his troops; and it provides for the maximum flexibility and effectiveness of engineer effort within the infantry division.

b. Company. The engineer companies are usually employed in support of the infantry battle groups; but

they remain under control of the battalion commander. The company can operate independently of the battalion when it is attached to an infantry unit. The company is not attached unless distance makes centralized control by the battalion difficult.

c. Platoon. The platoons may be employed in area assignments to accomplish all engineering work in the area; or they may be given task assignments or specific jobs to do. The platoon does not operate independently of the company, except for short periods, because it needs materials and assistance from company headquarters. The platoon may be employed in direct support of an infantry task force or in general support of the same unit under company control. However, the platoon is generally kept under company control.

d. Squad. The squad normally functions as a part of the platoon or independently as a unit under platoon control. Occasionally, when attached to a small task force, it may be given a separate engineer mission. The platoon leader avoids frequent employment of a platoon by separate squads because such a breakdown contributes to improper supervision and command and ineffectiveness of engineer effort.

41. Offensive Movements

a. Definitions.

(1) A march in a combat zone is a tactical march when the column will be employed against the enemy upon making contact or when interference from the enemy is a possibility. The mission of the column, proximity of hostile ground forces, terrain over which the column will travel, types of enemy resistance ex-

pected, and activity of hostile air forces are all primary factors that determine the organization and composition of the column in a tactical march. Divisional movement orders are prepared by G3, in coordination with other staff officers. G3 coordinates particularly with G4 in the selection of routes and in movements requiring transportation in addition to organic transportation. Divisional units, including the engineer battalion, should maintain tables showing road space requirements for their units based on actual strength and material on hand. However, these basic figures may be greatly increased or decreased under extremes of variable factors such as weather, road conditions, and hostile air and mechanized threats. Basic road spaces for both foot and motor elements are shown in FM 101–10.

(2) During a motor march, the infantry division may either move in one trip by use of attached transportation or by echelon. If the latter move is made in echelons of three or four serials each, each serial is usually composed of a battle group with separate serials for division troops and division trains. Necessary trucks in the first echelon return to assist in moving the second echelon. Security for the move is normally furnished by the infantry division cavalry squadron. See FM 101–10 for road space, time lengths, march graphs, and march tables.

b. Battalion Participation. The engineer battalion

participating in an infantry division tactical march will normally furnish reinforced engineer companies to support leading battle groups and will furnish engineer support to the flank security elements. The remainder of the battalion normally marches with the division troops serial. The battalion may be required to furnish vehicles to assist in the movement of troops in both echelons. Certain equipment and vehicles from the engineer battalion may be attached to the division trains as directed by the division engineer.

c. Battalion Marching Unit. When the infantry division engineer battalion marches as a separate unit, the following conditions apply:

(1) *Formation for the march.* The tactical situation governs the march formation. Each company normally forms a march unit; however, when the battalion moves as a unit the companies, less heavy equipment, comprise a serial. Heavy equipment is grouped to form a march unit.

(2) *Control and supervision.* The battalion commander designates a staff officer to check the formation of the column, to check the arrival of subordinate units, and to check the order of march. Well-marked routes, road markers, and road guides also assist in control of the column and in smooth movements. Certain battalion officers are appointed to periodically check the column. Items to check include condition of vehicles, distances between march units, and speed.

(3) *Communication.* When signal security permits, radio is the principal method of com-

munication while the battalion is on the march. However, visual signals, particularly arm-and-hand and flag signals, are used extensively for column and vehicle control.

(4) *Road markers and guides.* Whenever possible, road markers are used at all points where there is any question of which route the column should take. The battalion commander arranges for the personnel who are serving as guides to be picked up by the last vehicles of the column.

(5) *Halts.* Halt times are based on the initial point crossing time of the leading elements of the column. The battalion SOP should prescribe a 15-minute halt at the end of the first hour and 15-minute halts every 2 hours after that. March units halt during this period and continue to maintain proper interval. All vehicle drivers and vehicle crews perform their scheduled "at halt" maintenance operations. The battalion commander knows the rate of fuel consumption of his organization; and he schedules his refueling halts in advance of the march.

(6) *Security.* All movement in the combat zone is governed by strict security regulations, with special attention to the possibility of air attack. The distance between vehicles is greater than in rear areas. Panel sets are kept in readiness for instant use to avoid attack by friendly aircraft. The battalion is well trained in passive defense against air attack. When there is a possibility of ground

attack, as in a fluid situation or when guerrillas are operating in the area, the battalion commander makes tactical plans to meet the attack. He establishes a system of observers and signals. He requires the troops to keep individual weapons readily available; and he disperses rocket launchers and manned machine guns throughout the column.

(7) *Night marches.* The engineer battalion commander gives special attention to planning and excuting night marches. He trains the troops by constant practice on unfamiliar roads of all types so that the battalion is able to conduct night marches under all conditions. In a night march, the importance of route reconnaissance, road guides, and road markers increases. Decreased speed, decreased distance, increased reconnaissance, and increased security make the control of a night march easier.

42. The Advance to Contact and the Attack

There are four general types of offensive action: envelopment, penetration, turning movement, and frontal attack. The infantry division normally will not conduct offensive action alone. It will participate as part of a larger force. In participating in the four general types of offensive action, the infantry division will be required to conduct an attack or an advance to contact. Exploitation and pursuit are phases of offensive operations which may be continuations of either the advance or the attack. The division engineer recommends disposition of available engineer troops and equipment for all phases of the advance and

attack (figs. 11 and 12), based on the scheme of maneuver announced by the division commander. He recommends appropriate changes in disposition as the need arises. Engineers may be used in the advance guard and in the flank and rear security forces as well as in the main body. If the engineer battalion is unable to perform all the engineer required, the division commander may request reinforcement. In this case, additional engineer units are placed in support of the division engineer battalion by corps or army. Regardless of the seniority of the supporting engineer unit commanders, the commander of the infantry division engineer battalion remains the division engineer and directs the engineer work in the division area through liaison with the supporting units or through recommendations to the division commander.

a. Penetration and Frontal Attack. Infantry division engineers are placed in direct support of each attacking battle group. The size of the engineer elements in direct support is governed by the anticipated strength necessary to reduce obstacles and to support the advance of the attacking force. Bridging, AVLB's (armored vehicle launched bridge), and combat engineer vehicles are positioned so that they are available when needed. When the situation warrants, infantry division engineer elements can be attached to each leading reinforced battle group or placed in support of the battle group. Engineers held under division control have the mission of assisting in the movement of the remainder of the division.

b. Envelopment and Turning Movement. In the envelopment or turning movement, infantry division engineers are well forward in the column in order to

facilitate the advance of the division. One company of engineers and elements of the bridge and equipment platoons are normally attached to, or in support of, each of the major tactical commands to be used in the attack. In these circumstances, the engineer battalion, less detached elements, is under division control.

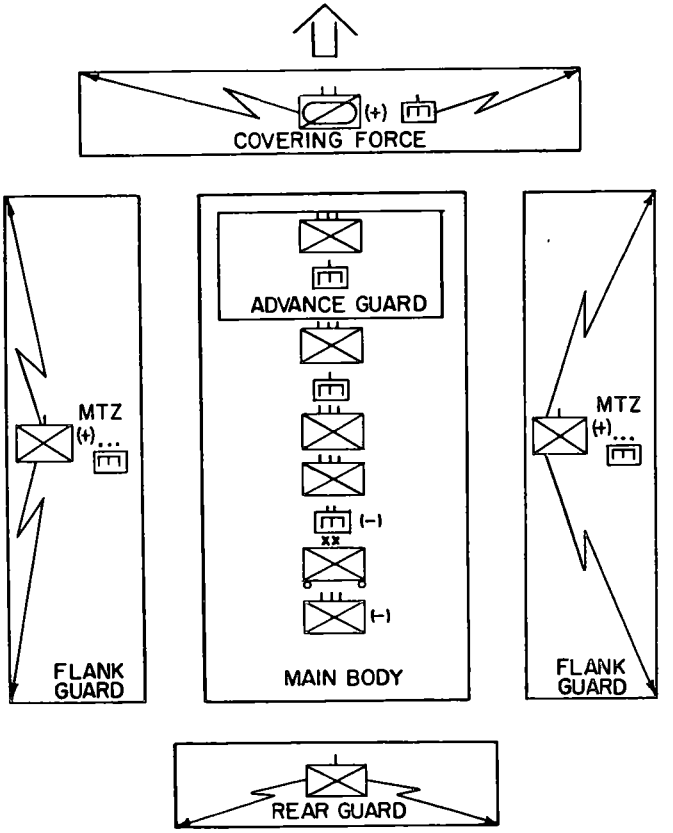


Figure 11. Typical disposition of the engineer battalion organized for the advance to contact.

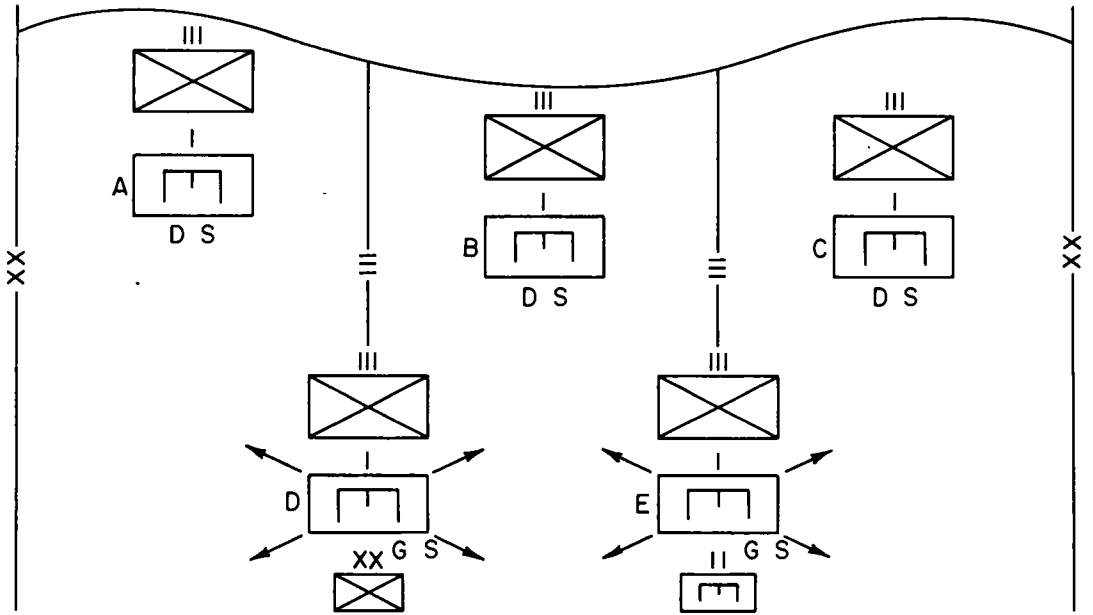


Figure 12. Disposition of the engineer battalion in the attack.

c. Exploitation or Pursuit.

(1) *Division in column.* When the battle groups of the division are in column, an engineer line company, with the bridge platoon attached, may be attached to the leading battle group or in support of it (fig. 13). The battalion, less detached elements, is usually kept under division control. If additional bridging is attached to the division by corps, it may be kept under division control until it is needed by the leading combat command or until a following major command is committed to action or placed on another axis of advance.

(2) *Division in line.* When two or three groups are following independent axes, each is given enough engineers and bridging equipment to move it over its assigned axis.

d. Covering Force Action. A cavalry squadron employed as an advance covering force will normally have an engineer platoon in support. However, because of the distance involved in a covering force action, the infantry division engineer platoon, with necessary bridging, is attached rather than in direct support.

43. Engineer Missions

a. During the advance to contact and the attack, emphasis is placed on off-the-road parking facilities, bivouacs, and camouflage. Reconnaissance is detailed and continuous and is conducted, in part, by all commanders concerned.

b. In general, the mission is to assist the forward movement of attacking echelons. The specific mission may be considered threefold:

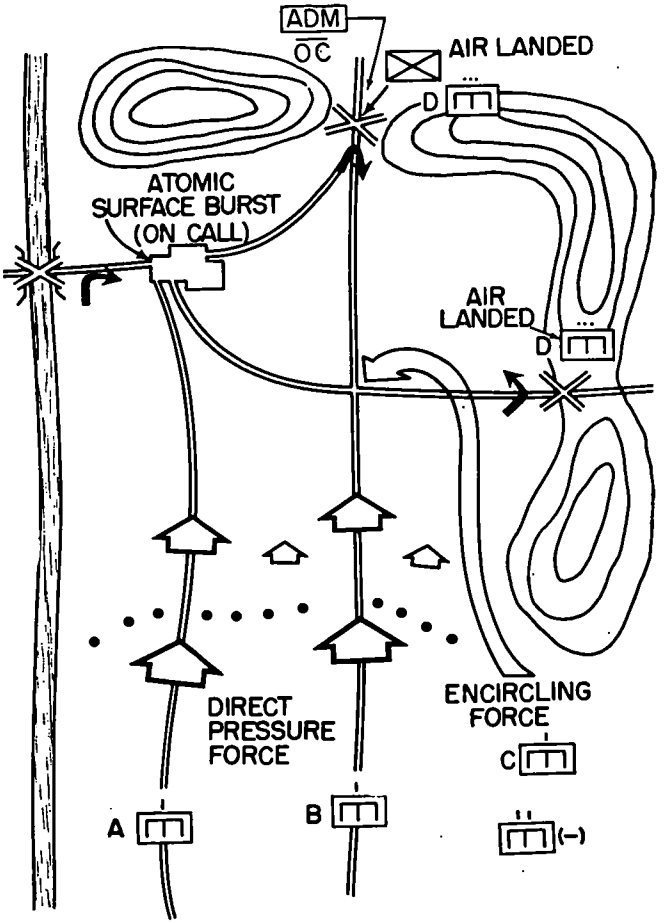


Figure 13. Typical disposition of the engineer battalion in the pursuit.

(1) Assisting the movement of infantry and supporting arms.
(2) Assisting the troops protecting the flanks and rear by creating obstacles in roads and other possible avenues of approach to the flanks and rear.
(3) Performing general engineer tasks.

44. Control of Engineer Effort

a. Disposition of Engineer Troops. The division engineer recommends the disposition of engineer troops for each division operation. Such disposition is normally made by assigning engineers specific tasks; placing engineer units in support of other elements; or, in some cases, by attachment.

b. Responsibility for Control. The division engineer maintains contact with the advanced elements to assure that maximum value is obtained for the engineer effort expended. The engineer unit commander retains control and command of the engineer element but must suit his plans and troop employment to the plans of the supported unit or units.

c. Liaison.

(1) Liaison between supporting and supported units and between adjacent units must be maintained during the attack to assure cooperation and coordination between all units participating in the operation. It is the responsibility of the supporting unit to establish and maintain liaison with the supported unit. Liaison between adjacent units is established as directed by the senior commander. Usually, each unit is charged with maintaining liaison with the unit to the right.

(2) The assistant division engineers are the chief liaison agents between the engineer battalion, division headquarters, and brigade headquarters. Similarly, liaison functions between the supporting engineer company and a battle group are performed by personnel designated by the company commander. The liaision officer is familiar with the capabilities and operations of both units; and he keeps himself completely informed of all plans and operations in order to give reliable, up-to-date information and advice to both commanders. If a further breakdown of engineer elements becomes necessary, the engineers establish and maintain liaison with their supported units.

45. Typical Engineer Duties

Engineer duties in the attack include—

a. Conducting engineer reconnaissance.

b. Locating, marking, and removing mines (fig. 14).

c. Constructing advance landing facilities (fig. 15).

d. Opening and improving roads, trails, bridges, fords for troop movement, supply and evacuation.

e. Assisting in preparation of traffic circulation plans.

f. Assisting in flank security through the use of demolitions, minefields, and obstacles.

g. Assisting forward movement of infantry and supporting arms by repairing roads, removing obstacles, and assisting in crossing gaps, streams, and rivers.

h. Supplying maps.

i. Such general duties as supplying water and engineer materials. These are continual and normal duties of battalion headquarters.

Figure 14. Advance party engineers search for mines.

Figure 15. Advance landing strip constructed by engineers.

46. Engineer Work Done by Other Arms

Because there are seldom enough engineer troops available to do all the engineer work necessary to assist the advance of the infantry and supporting arms, the other troops do as much of this work as possible in order to help themselves. All combat and service troops are trained in the installation and removal of antitank and antipersonnel mines. Infantry troops do much of their own engineer work, assisted by the engineer platoon organic to each battle group.

47. Engineers with the Advance Guard

a. Each column commander is supported by engineer troops. Some of these troops are normally in support of the advance guard. The commander of the engineer element functions as the unit engineer of the advance guard and maintains liaison with the advance guard commander. During the advance of a battle group, a platoon from the supporting engineer company normally forms part of the advance party (fig. 16).

b. An element of the squad usually travels with the point. These engineers have mine detectors and probes; and they search for mines and mark or remove them. They also remove all other obstacles within their capabilities. Removal of large obstructions may require additional engineer troops and equipment. Such engineer elements are moved forward from the support or reserve.

c. Engineer battalion reconnaissance parties may move with the forward elements of the advance guard to give timely warning of required engineer work to the supported and supporting units and to the engineer battalion commander.

d. The remainder of the engineers in the advance guard move with the advance guard (—) or reserve. They are not separated from their tools, transportation, and equipment. The advance guard engineers leave work parties at vital points where need for engineer

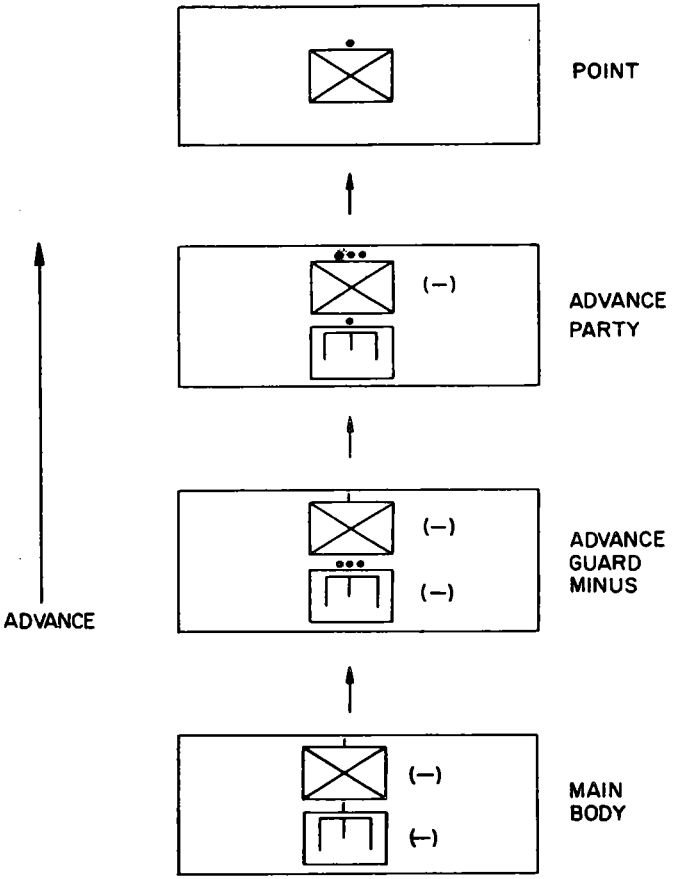


Figure 16. Engineer company on the march with a battle group.

assistance exists or can be foreseen. These details rejoin their unit on completing their task. The engineers with the advance guard may thus become depleted and by the end of the march may be deployed at a number of points. It may be necessary, therefore, to renew the engineer strength of the advance guard by substituting a new unit for the original one which was depleted during the march.

48. Initial Duties

The initial mission of the engineer battalion includes reconnaissance and preparation of the axial routes of advance. The preparation of the axial routes may require the rehabilitation of old, or construction of new, roads, trails, and bridges suitable for the wheeled and track-laying vehicles of the division. Consequently, the magnitude of the engineer effort may vary considerably. Rapid construction of advanced landing facilities for divisional aircraft may require considerable engineer effort.

49. Flank and Rear Security

The division engineers play a vital role in flank and rear security by placing demolitions and mines and constructing obstacles to prevent enemy interference against the division flank and rear. Flank and rear security measures depend on such factors as—

a. Extent of flank exposed.
b. Proximity of adjacent friendly troops.
c. Type of terrain over which attack is moving.
d. Reinforcing or reserve units available.
e. Natural obstacles.
f. Strength and morale of enemy forces.
g. Mobility of friendly and enemy forces.

50. River-Crossing Operations

In an operation which involves crossing a river, the immediate purpose is to get assault units across quickly and economically and establish a bridgehead which will protect the crossing of the remainder of the command and permit the attack to continue with the least possible delay. Since the river crossing is primarily an engineer responsibility, the division engineer makes the technical plans for the crossing. Engineer tasks in the crossing include guiding the assault echelon to the crossing site, operating assault and storm boats, assembling and operating ferries, assembling and maintaining footbridges and heavy vehicular bridges, removing mines, and constructing approach roads.

a. Types of Crossings. Plans for crossing a stream over which the enemy has destroyed all bridges depend on several factors, including the strength with which the enemy holds the opposite bank and the characteristics of the river. There are two general types of crossings—a hasty river crossing and a deliberate river crossing.

(1) *Hasty river crossing.* A hasty river crossing must be boldly executed to insure surprise; to prevent the organization of strong defenses; and, if possible, to seize an existing bridge or ford. Detailed reconnaissance and planning are secondary to speed. Advanced elements are crossed by any means available. Such crossings must be foreseen. All available equipment must be utilized promptly. When the opportunity for such a crossing is presented to an advance force, the supporting engineer troops aid in the immediate crossing and

exploitation. Bridges or other crossing means are constructed or repaired as soon as possible by the division engineers to enable the crossing of additional divisional troops which are rushed forward to exploit the initial success.

(2) *A deliberate river crossing.* A deliberate river crossing is necessary if the opposite bank is strongly held. Detailed planning, extensive logistical preparation, and air and ground superiority are required. Overall planning and coordination are preformed by corps or higher commands. The division engineers are normally utilized in the assault phase of this type crossing (fig. 17). Some elements will assist corps engineers in the operation of assault-type craft; and other elements will move forward with the assaulting troops, usually on foot, to render engineer support as required. The remainder of the committed division engineer elements cross as soon as means are available for engineer equipment, materials, and tools to be provided to the attacking force. Headquarters and headquarters company and the noncommitted companies will normally move across immediately after division headquarters. Seldom, if ever, will the equipment of the bridge platoon be employed in the deliberate river crossing. Elements of the equipment and bridge platoon are usually attached to the engineer companies supporting the assaulting battle groups for use in establishing the bridgehead and for use of the exploitation

forces. FM 31–60 discusses the employment and duties of the engineers in river-crossing operations.

b. Equipment and Capabilities.

(1) *General.* The infantry division engineer battalion has a limited river-crossing capability. The bridge platoon in headquarters company has assault boats, outboard motors, light tactical rafts, and armored vehicle launched bridges. With this limited amount of bridging equipment, the engineer battalion is restricted to spanning short gaps and aiding the assault effort in offensive operations. Extensive operations require backup support from corps and army in the form of additional fixed, floating, and assault bridging equipment and units. See FM 31–60 for details.

(2) *Assault boats.* The bridge platoon of headquarters company has eighteen assault boats.

Figure 17. River-crossing operations, assault phase.

The boat is designed to cross infantrymen and their individual equipment during the initial phase of a river-crossing operation. It can be propelled by an outboard motor of up to 25 horsepower with which it develops a maximum speed of 11 feet per second under a full load of 3,300 pounds. Maximum speed attainable by paddling with a normal load of three engineers and twelve fully-equipped infantrymen is approximately 4 feet per second.

(3) *Bridge, floating, raft section, light tactical.*

(*a*) The unit of issue of the bridge, floating, raft section, light tactical, is a set to provide components for one 4-ponton reinforced raft or 44 feet of normal floating bridge or 38 feet of fixed bridge. Equipment and materials required for the transportation, assembly, employment, and maintenance of two such sets are provided in the authorized equipment in the bridge platoon of headquarters company. For details, see TB 5–271–1.

(*b*) The light tactical raft equipment is used to assemble rafts, limited floating bridges, and fixed spans. Both the raft and the bridge (figs. 18 and 19) consist of a deck built of aluminum deck sections, supported on aluminum pontons. Fixed spans are assembled by joining deck panels

(*c*) The most commonly used raft is a four-ponton raft, consisting of two end panels and three bays of decking supported on

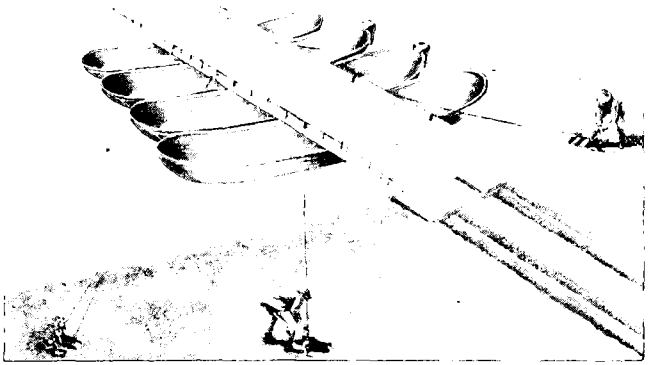


Figure 18. Light tactical raft.

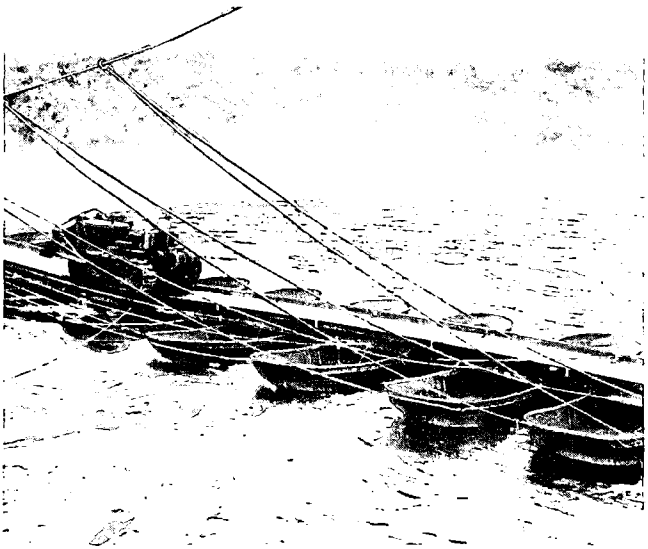


Figure 19. Floating bridge.

Table I. Raft Classes, Light Tactical Rafts, Assembly by Successive Pontons.

Type		Stream Velocity in FPS for Specified Crossings											
		Normal						Risk					
FPS		3	5	7	8	9	11	3	5	7	8	9	11
4 Pontons	3 Bays	12	12	12	12	9	0	20	20	20	16	12	4
5 Pontons	5 Bays	12	12	12	12	9	3	19	19	17	15	12	6
6 Pontons	4 Bays	19	19	19	19	13	6	24	24	24	24	23	11

Table II. Classes of Floating Bridge Constructed from Light Tactical Raft Sets, in Various Current Velocities.

Normal Type of Assembly	Stream Velocities in FPS, Specified Crossings																	
	Normal						Caution						Risk					
FPS	3	5	7	8	9	11	3	5	7	8	9	11	3	5	7	8	9	11
Class	16	16	13	11	8	2	18	18	15	12	9	3	21	21	17	14	11	5

four pontons. Loading space width from curb to curb is 108 inches, and loading length is approximately 29½ feet. Table I indicates the classes of different type rafts in various stream velocities.

(*d*) The light tactical bridge may be assembled in normal width of 108 inches; or by simple modification, a deck width of 132 inches can be provided. The capacity of the floating bridge is given in table II.

Class						
Clear Span (Feet)	Normal		Coution		Risk	
20	(21)	17	(25)	19	(32)	23
22	(18)	15	(20)	17	(23)	19
24	(16)	13	(18)	15	(20)	17
26	(14)	12	(16)	14	(18)	16
28	(12)	11	(14)	13	(16)	15
30	(11)	10	(12)	12	(16)	14
32	(10)	9	(11)	11	(15)	13
34	(9)	8	(10)	10	(13)	12
36	(8)	7	(10)	9	(11)	12
38	(7)	7	(9)	9	(10)	11

NOTE: 1. Figure in porentheses represents wheel load class

2. Second figure represents tracked load class.

Table III. Dual Classification Capacities, Short Fixed Spans of Light Tactical Raft.

(*e*) Components of the light tactical raft set can be used to provide fixed bridging capable of crossing vehicles, troops, and equipment over short gaps such as washouts, ravines, marshy ground, demolished bridge spans, and any similar obstructions. Table III indicates the classification capacities of short fixed spans.

(4) *Armored vehicle launched bridge (AVLB).* The armored vehicle launched bridge is a class 60 bridge, utilized to cross short gaps of 60 feet or less in a minimum of time and with minimum exposure of erection personnel to enemy fire. The AVLB is crew-served, highly mobile, and capable of quick erection. There are three launchers and six bridges organic to the bridge platoon of headquarters company. See TC 5–2 for details.

51. Attack on Fortified Positions

a. The duties of engineers in assaults on fortified positions are fundamentally an application, to the operations of a combined arms team under heavy fire, of the technique of passing obstacles (FM 31–50). The assault on a fortified position can be divided into four phases. In action they often overlap, especially on weaker parts of the front. These phases are—

(1) Reducing the hostile outpost system and developing the attack.

(2) Breaking through at the most favorable point.

(3) Extending the gap by isolating and reducing hostile emplacements on its flanks.

(4) Moving mobile reserves through the gap to complete the encirclement and isolation of the

remaining fortifications, while continuing the attack from the front.

b. Immediate exploitation of success is imperative in each phase. If the position is organized in depth, the attack must proceed to the second line of fortifications as soon as possible after breaking through the first. The same techniques are used in reducing a second line as in the case of the first line.

c. During the attack, the principal mission of the engineers is breaching the outer and larger obstacles which protect the fortified positions. Reduction of weapons emplacement, bunkers, and pillboxes and the clearing of close-in and minor obstacles are the mission of specially organized and equipped infantry squads which lead the attack. This means that the effective gapping of a strong enemy fortification system requires close coordination between the engineers, who gap the line of obstacles, and the infantry, who reduce the fortifications. Combat engineer vehicles from the equipment platoon of headquarters company are particularly designed for this type of combat and should be placed well forward in the column to provide maximum support.

d. After the fortified line has been breached, the primary engineer task is creating and maintaining routes to and through the gap. Engineers also render captured forts or pillboxes unsuitable for reoccupation.

e. Engineer casualties will be heavy in operations of this sort, and trained replacements must be immediately available.

f. Before the assault begins, a preliminary engineer study is made of the terrain, bridges, routes of communication, and artificial obstacles such as minefields,

tank traps, and emplacements. The technique of attack and the requirements for engineer breaching personnel, supplies, and subsequent reconstruction are planned from this study. Information for the study may come from various sources, of which ground reconnaissance is the most satisfactory. For areas beyond the reach of ground reconnaissance parties, information must come from aerial photographs and other sources.

g. Ground reconnaissance before the attack should, if possible, cover obstacles in front and on the flanks of the enemy main battle position. Minefields are reconnoitered to determine their boundaries; the type of mines; the presence of gaps in the field; and whether and how they are marked; possible detour and approaches; and the location of defending weapons and gassed areas. The reconnaissance parties seek to determine the positions of the obstacles which are best adapted for clearing operations, either because of their weakness or because they are not well covered by fire.

h. Normally, reconnaissance is done by the troops who are to breach the obstacles. Parties are given definite routes and areas; carefully instructed in their duties; and, if necessary, rehearsed. Personnel are briefed on all information which has already been obtained.

i. The strength, organization, equipment, and means of transportation for each clearing party are carefully planned, on the basis of the party's mission and the nature of the obstacles. Parties may be organized to clear obstacles in front of the enemy position at the beginning of the attack; to clear obstacles encountered

within the enemy position as the attack progresses; or to dispose of obstacles already passed by the leading elements. The engineers who accompany infantry are moved as far forward as practicable in their own transportation; and the combat engineer vehicle is employed to assist in reduction of positions.

j. Clearing parties normally are organized into task groups. When the obstacle to be breached is formidable and complete information about it is available, the task groups may be highly specialized, each having been instructed in detail and rehearsed in the performance of its precise duties. However, a flexible organization is needed to deal with obstacles encountered after the attack begins and on which there is little or no advance information. A typical party of this type might contain small groups as follows:

(1) A group to precede the breaching personnel and clear antipersonnel mines.
(2) A group to breach or otherwise neutralize the obstacle.
(3) A group to mark the boundaries of the gap and the routes between successive gaps.
(4) A group to provide local security.
(5) A group to lay smokescreens to cover the operations of the party.
(6) A contingent to furnish replacements or reinforcements to the other groups.

52. Defense

a. Infantry Division in the Defense. The infantry division employs the defense to deny a vital area to the enemy, to protect a flank, to contain an enemy force, to gain time, to economize forces, or to bring about maximum destruction and disorganization of the

enemy. The division may assume the defensive upon order by higher headquarters or voluntarily, or it may be forced to defend by the situation (fig. 20).

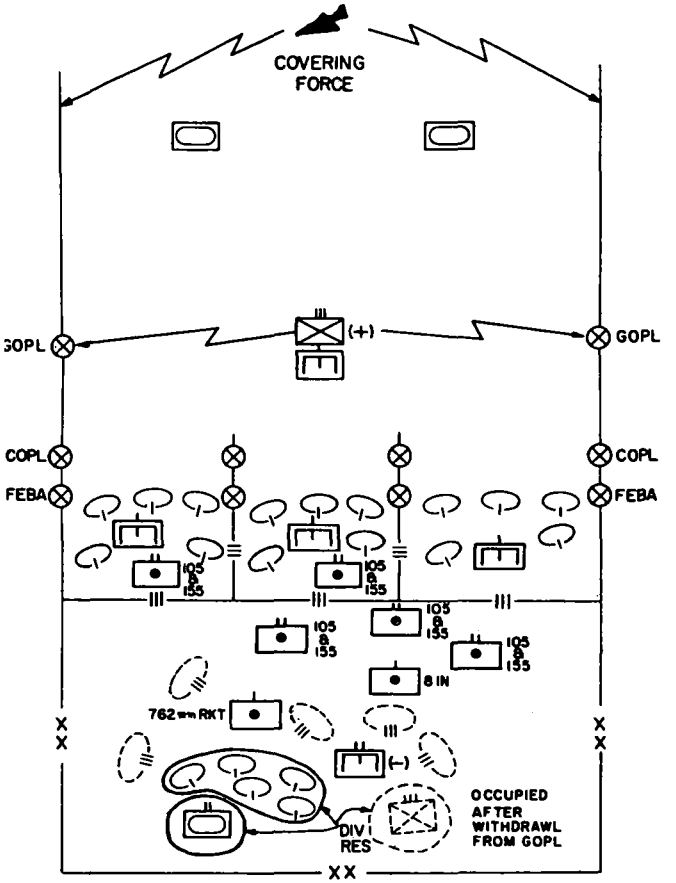
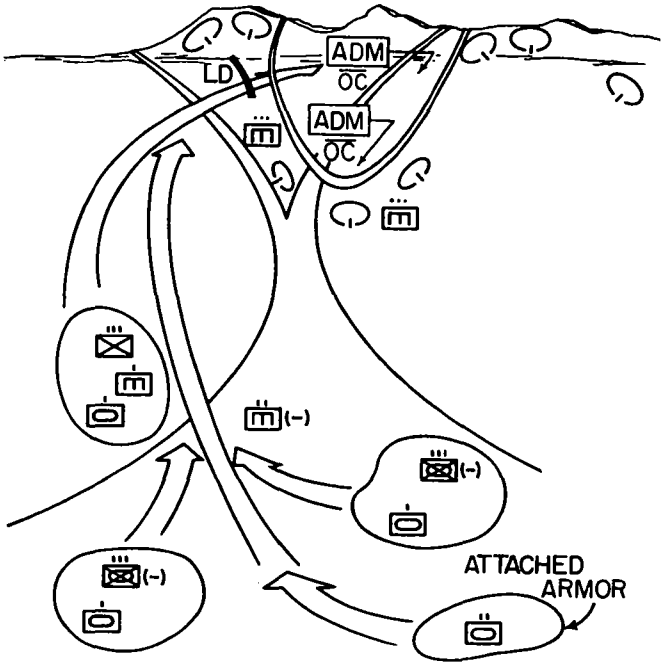


Figure 20. Typical disposition of the engineer battalion in the defense.

b. Types of Defense. When the battle group commander receives the defense order from the division commander he formulates the plan of defense. The mission is the main factor which he considers when he is organizing for the defense, although composition of the opposing forces, the terrain, and security are also important. There are two basic types of defense, with variations in between. The basic types are position defense and mobile defense.

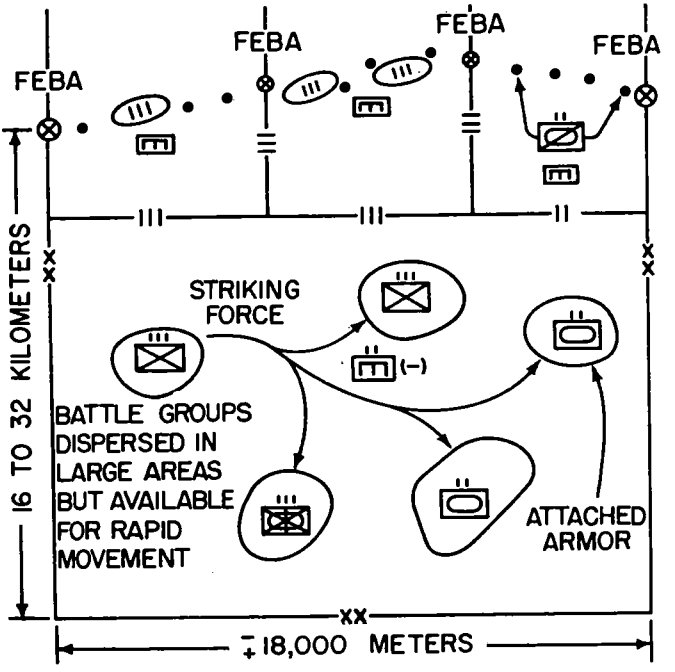
(1) *Position defense.* The position defense is a relatively compact defense in which the battle area is organized into a series of mutually supporting positions. Forward positions of the battle area are strongly held. Terrain may be controlled, at least temporarily, with nuclear fires. Units may be in dispersed assembly areas adjacent to critical terrain, prepared to occupy it or to call for nuclear fires on it if its seizure is threatened. The defense is relatively shallow, and the position is organized with the aim of stopping the enemy forward of the battle area.

(2) *Mobile defense.* The mobile defense is fluid. Forward areas are lightly held by forces which block, impede, and canalize the enemy. The larger portion of the force is in reserve to be used in offensive action. The mobile defense envisages decisive combat within the battle area. Battle group frontages and depths are greater than those for the position defense. The smaller number of troops in forward areas may result in the forward battle groups not being mutually supporting. However,



1. HOLDING ELEMENTS IN BLOCKING POSITIONS OR SWITCH POSITIONS.
2. STRIKING FORCE IN DISPERSED COMPANY ASSEMBLY AREAS.
3. MULTIPLE ROUTES MAY BE USED.
4. BATTLE GROUPS MOVE INTO COLUMN FROM COMPANY ASSEMBLY AREAS.
5. ONLY A PORTION OF STRIKING FORCE MAY BE USED IF ADEQUATE TO ACCOMPLISH MISSION.
6. ELEMENTS OF STRIKING FORCE MAY BE USED TO BLOCK.
7. EITHER BLOCKING OR COUNTERATTACKING FORCE MAY BE EMPLOYED BY ASSISTANT DIVISION COMMANDER AND BRIGADE STAFF.

Figure 21. Typical disposition of the engineer battalion in striking force of a mobile defense.



ENGINEERS ON FORWARD EDGE OF BATTLE AREA
SQUAD TO PLATOON SIZE

1. MINIMUM FIRE POWER FORWARD.
2. LIMITED MUTUAL SUPPORT.
3. AMPLE MANEUVER SPACE.
4. STRONG, HIGHLY-MOBILE, STRIKING FORCE.

LEGEND

- OBSERVATION POST
- STRONG POINTS - PLATOON TO REINFORCED BATTLE GROUPS

Figure 22. Typical disposition of the engineer battalion in a mobile defense.

mutual support, by coordinating fields of fire, is sought whenever possible. Figures 21 and 22 show typical dispositions of the engineer battalion in the mobile defense.

c. Responsibility of Engineers. In general, defensive positions are laid out and constructed by the troops which are to occupy them. However, engineers are used extensively in performing such duties as—

(1) Conducting engineer reconnaissance.
(2) Repairing, maintaining, and improving roads for supply and evacuation.
(3) Recommending traffic circulation plans.
(4) Assisting in field fortifications by providing engineer technicians, mechanical equipment, power tools, engineer materials, engineer technical advice, and similar help.

53. Organization of the Battle Area

a. General. Each unit commander assigned an area to defend makes plans, with the help of his unit engineer, for the organization of this battle area. His plans are based on the plan of the next higher echelon, on thorough reconnaissance, and on the troops and weapons available. Outposts, strong points (fig. 23), and alternate positions are planned. The troops who are to occupy the positions do most of the work in preparing their defenses, but they are aided by the engineers. Special emphasis is placed on the best use of terrain, natural concealment, obstacles, observation and fields of fire, and avenues of approach.

b. Elements of Defensive Position. A fully organized defensive position normally includes the following elements:

(1) An air security echelon which may include

both tactical (Air Force) planes and organic aviation of the ground forces.

(2) A covering force, normally provided by corps.

(3) Reconnaissance security forces which are divided into a general outpost line (GOPL) and, to the rear of this, a combat outpost line (COPL). In extended variations of mobile,

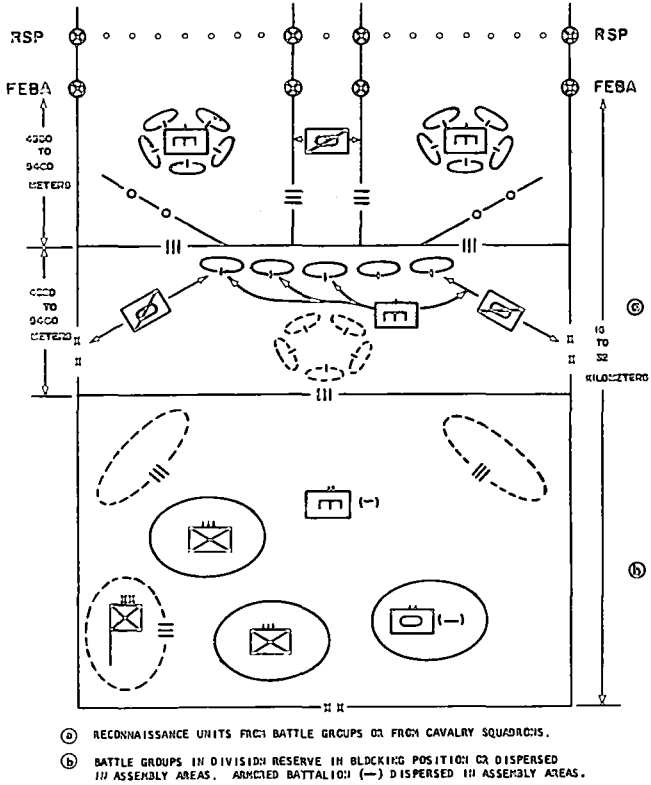


Figure 23. Typical disposition of the engineer battalion in a mobile defense based on battle group strong points.

all-round, and extended variations of position defense, the general outpost line may be replaced by reconnaissance and security (R&S) forces. These forces consist of the personnel manning a series of outposts, roadblocks and observation posts, and reconnaissance detachments. The forces may be provided by the forward battle groups or other divisional units. The division commander normally prescribes the trace of the R&S line by specifying locations of importance to the division as a whole, although corps may prescribe it when the division is operating as part of a corps. When a battle group performs the R&S mission, augmentation from divisional units of armored carriers, trucks, tanks, communication facilities, and a target acquisition element may be required. During the conduct of the R&S mission, habitual use of army aviation will enable R&S forces to extend the range of reconnaissance, to provide earlier warning, and to assist in calling for atomic and nonatomic fires. Small patrols and personnel manning roadblocks and observation posts may be moved by helicopter.

(4) An organized battle area, based on the forward edge of the battle area (FEBA), and including the battle group reserve area.

(5) The service area, which is the rearmost portion of the division sector. Within this area are the division service installations as well as the reserve battle groups.

c. Basic Points. A commander should consider the

following basic points in planning the defense of his assigned area:

(1) *Proper use of terrain.*

(*a*) *Critical terrain.* The commander should consider how terrain fits into the scheme. He should not be rigidly bound by any set patterns of holding the high ground or always occupying the critical terrain. Repeated occupation of key terrain features could provide the enemy with lucrative nuclear targets. The defender's capability of employing nuclear weapons permits the temporary loss of critical terrain without seriously jeopardizing the successful accomplishment of the mission.

(*b*) *Cover and concealment.* Natural features of terrain and manmade cover may reduce the effects of nuclear weapons. Concealment by artificial and natural means makes target acquisition by the enemy more difficult.

(*c*) *Obstacles.* Natural and manmade obstacles (fig. 24) assist in canalizing enemy troop movements or causing the enemy to mass, thereby presenting a nuclear target. Obstacles covered by effective fire will cause the enemy to attempt to bypass or to mass the necessary force to overcome the obstacle. Full advantage should be taken of all natural obstacles in the organization of the defense to enable the defender to remain as dispersed as possible and still adequately defend avenues of approach.

(*d*) *Observation and fields of fire.* The value of

high ground for observation is undiminished. Increased use is made of air observation posts. Nuclear weapons and artillery may be used to protect gaps between positions within the division battle area.

(*e*) *Avenues of approach.* Nuclear weapons facilitate the control of avenues of approach to and into the battle areas. Analysis of the avenues of approach provides a basis for the location of atomic demolition munitions. Increased dispersion between units opens additional avenues of approach from all directions.

(2) *Security.* The enemy's nuclear capability, which necessitates increased dispersion of friendly forces, creates a need for additional emphasis on all-round security. In the de-

Figure 24. A log obstacle constructed by engineers.

fense, the security forces may attempt to force the enemy into premature deployment. On the other hand, they may allow the enemy to come closer to the defensive area or into areas where defensive nuclear fires are more effective. The capability of the defender to employ nuclear weapons may make possible the destruction of the attacker by numerically inferior forces.

(3) *Mutual support.* The more extended defense under nuclear conditions requires the achievement of mutual support by the positioning or movement of units, by the location of units in relation to each other, by the ability of one unit to reinforce another by fire or movement, and by the mobility of reserves rather than by the proximity of units to each other.

(4) *All-round defense.* Provisions are made to prepare alternate and supplementary positions for all-round defense.

(5) *Defense in depth.* Maximum depth of defense is a requirement under nuclear warfare conditions because the enemy may be expected to rapidly exploit his nuclear attacks. Positions are organized in depth to attain dispersion and contain penetrations.

(6) *Barriers.* An effectively coordinated barrier system is of particular importance when defending on the wide frontages which are normal under conditions of nuclear warfare. Use of atomic demolition munitions assists in creating additional obstacles. Careful consideration must be given the necessity for freedom of maneuver of reserves.

(7) *Coordinated fire plan.* When used, nuclear fires dominate the defensive fire plan. Nonnuclear fires are planned to assist in the defense of unit positions, to cause the enemy to mass, and to augment the effects of nuclear fire. Troop safety is a major consideration in planning fires. The fire plan brings the enemy under fire at long ranges, keeps him under increasingly heavy fires as he approaches the battle area, and assists the counterattacking forces.

(8) *Flexibility.* The flexibility afforded the defender by possession of nuclear weapons is greater than in a nonnuclear situation. Organizational flexibility of the division is retained by rapid shifting of forces in the defense and by retaining an adequate reserve for commitment at a decisive time.

(9) *Maximum use of offensive action.* In fluid situations with wide frontages and great depths, there will be many opportunities to regain the initiative by offensive action. Destruction of the attacking forces by nuclear supported counterattacks will be a frequent occurrence.

(10) *Maximum dispersion.* The degree of dispersion required of units in nuclear warfare is of major importance to the defender. Dispersion applies to administrative and tactical units. It must not be enough to cause rigidity in the defense, fragmentation of combat power, inability to maneuver, or inability to destroy enemy penetration.

54. General Outpost

a. The general outpost is organized forward of the forward edge of the battle area. There is no prescribed organization for a general outpost. It is normally a balanced combined arms force including elements of engineers and necessary logistical and air support. It may be supported by artillery fire, including nuclear fires. The general outpost force is as mobile as conditions permit, using tanks, armored personnel carriers, trucks, and army aviation. It may consist of the armored cavalry squadron reinforced by a tank element, artillery, and engineers; or it may be a mechanized battle group reinforced with the cavalry squadron elements of the tank battalion, artillery, and engineers. The general outpost gives early warning of the enemy's approach and deceives and forces him to deploy. It also covers the withdrawal of the covering force and locates nuclear targets. It accomplishes its mission by delivery of intense fires, including nuclear fires; use of obstacles and demolitions, including atomic demolition munitions when authorized; aggressive patrolling and reconnaissance; delaying action, deception measures; and, when necessary, use of close combat. The general outpost attempts to never become decisively engaged.

b. An engineer company will normally be attached to the general outpost force. The company commander advises the general outpost force commander on engineer work and assigns missions and areas of responsibility to his platoons. Each platoon with an area assignment is responsible for keeping open the main withdrawal route within its area, and it prepares the obstacles along that route. A small detachment of engineers, normally a noncommissioned officer and a few men, are left at each site. This detachment has

specific instructions as to when to effect the obstacle so that it will be accomplished neither too soon nor too late. As additional assurance of proper execution, the engineer platoon leader is responsible for each route, while the time of execution is coordinated by the company commander. The order to execute obstacles on each route is normally given by the senior tactical commander of the general outpost withdrawing over that route. Each platoon leader is also responsible for preparation and execution of obstacles on the lateral roads within his respective area. If two engineer companies should be attached to the general outpost, the battalion executive or other designated officer should be sent forward as the unit engineer to coordinate the engineer effort of the two companies and relieve the company commander of this additional duty.

c. The very nature of the mission of the GOPL lends itself to the use of obstacles and demolitions. The GOPL is to delay the advancing enemy.

(1) This delay can be increased by destruction in his routes of approach. Obstacles will be used by the general outpost to further delay and disorganize the enemy advance. They will include such means as road craters, destruction of bridges, and the installation of minefields to canalize enemy movement.

(2) Extended frontages and dispersion of units acting as part of the general outpost (or as R&S forces) will necessitate an increased mobility for the defenders. Engineer units must keep routes of communication open to facilitate rapid movement of units from one position to another.

(3) With larger areas assigned to tactical units, the requirement for engineer effort will be greatly increased. Such conditions require that work of an unskilled type be handled by the supported units themselves. The engineer units will be responsible for providing technical assistance to aid in the rapid, efficient accomplishment of these jobs.

(4) Construction on a GOPL will be primarily of a pioneer nature. It may include the preparation of defensive positions and decoy emplacements, repair and reinforcement of existing bridges, clearing of areas for helicopters, and construction of trails.

55. The Combat Outpost

a. The primary mission of the combat outpost is to provide early warning of the advance of the enemy and to deny him close ground observation of the battle area. It delays and disorganizes the enemy. It is made as mobile as terrain and equipment available to the battle group permit. If the combat outpost is provided with armored personnel carriers and has tanks attached, it may be able to place additional emphasis on delay and disorganization of the enemy. It avoids close combat. Depending upon the situation, the COPL may be manned by units ranging from a reinforced rifle platoon to a reinforced rifle company for each battle group frontage. Responsibility for organizing and manning the COPL is normally assigned to the frontline companies, but may be assigned to the reserve company commander of the battle group. Outpost commanders are normally authorized to withdraw the combat out-

post when it has completed its mission or to prevent its capture or destruction.

b. On the COPL, engineers have approximately the same mission as is the case with the GOPL, though on a smaller scale. The battle group engineer platoon may be under operational control of the engineer company which is in direct support of the battle group. If this has been done, the engineer company commander may place the platoon in support of the COPL. Engineer tasks would generally include—

(1) Preparation and execution of conventional demolitions, and atomic demolition munitions.
(2) Preparation of obstacles.
(3) Pioneer construction tasks.

56. The Battle Area

a. The main battle area is a zone of resistance extending from the FEBA to the rear of the frontline battle group area. The battle area consists of a number of defense areas disposed irregularly in width and depth. Each of these defense areas is organized for all-round defense with foxholes, obstacles, and weapons emplacements. A battle group commander assigned an area to defend makes plans, with the help of his unit engineer, for the organization of his battle area. His plans are based on the overall defensive plan of the division, on thorough reconnaissance, and on the troops and weapons available. Outposts, strong points, and alternate positions are planned. The troops who are to occupy these positions do most of the work in preparing them, but are aided by the engineers. Special emphasis is placed on the correct use of terrain, natural concealment, obstacles, observation and fields of fire, and avenues of approach.

b. Engineer support along the FEBA is normally provided by the engineer company in direct support of each frontline battle group. The remaining engineer companies are in general support of the division with a secondary mission of supporting on order the infantry battle group with which they are normally associated. Engineers supporting the frontline battle groups may be given task assignments on the COPL. In the absence of a COPL, they may be called upon to provide engineer support for R&S forces.

57. Fortifications and Obstacles

a. Types of fortifications and priorities of construction are specified by higher headquarters. In constructing deliberate positions, precautions are taken to conceal from the enemy the location of the principal defensive elements. Dummy and decoy positions may be constructed for deception. Weapons emplacements and troop shelters must fit the terrain and the means available. They must give as complete protection as the time, troops, and materials available permit. Local materials and expedient construction are used to the maximum in order to reduce logistical requirements. Construction work to strengthen the position is continued during the entire period of occupancy. For prescribed types of fortifications, see FM 5–15.

b. Construction priority provides for efficient use of available time, personnel, tools, and materials. It insures that maximum value is derived from the time and labor already expended, if the area is attacked before construction is completed. Camouflage and the preparation of decoys normally proceed concurrently with other work if the tactical situation permits. In organizing deliberate areas, construction should con-

tinue as long as possible after contact with the enemy. For suggested priorities of construction work, see FM 101–10.

c. Normally, the use of artificial obstacles is limited by the time, labor, and materials required for construction. The most satisfactory method of creating an obstacle in ordinary terrain is by demolition of bridges over unfordable streams. Bridges are prepared for demolition and destroyed, on order, to prevent them from falling intact into enemy hands. All "prepared" bridges must be adequately guarded to prevent enemy interference with the explosive. Roadblocks on main road nets in locations difficult to bypass, such as heavy woods, steep sidehill slopes, or swamps, are also satisfactory. For details of demolitions, field fortifications, and barriers, see FM's 5–15, 5–25, and 31–10. In open country, minefields (fig. 24) are the most practical obstacles. For a detailed discussion of minefield technique, see FM 20–32. Engineer troops are used in preparing the obstacles, or they may supervise construction if other troops are available for the work. Care must be exercised in planning and siting obstacles, particularly in the rear and flanks of the battle area so as not to interfere with the planned commitment of the reserve elements. Obstacles are normally defended by infantry or armored units. Defended obstacles are organized into a coordinated system of successive battle areas from divisional barrier zones in depth.

58. Service Area

a. In addition to barriers in depth, from the general outpost through the battle group reserve area, blocking positions are prepared in the rear of the battle group

Figure 25. Engineers installing minefield.

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reserve area. These blocking positions are planned by the division commander and prepared by the battle groups not on line, assisted by the engineers. Positions are selected and organized to prevent major penetrations from securing lightly held or exposed flanks and are occupied by elements of the division reserve. Full advantage is taken of natural terrain features. Positions are prepared for all-round defense. Emphasis is placed on defense against armored attack and possible nuclear strikes. Engineers play an important role in the preparation of service area defense and in the construction of alternate positions.

b. Engineers in the service area are normally held in general support and then will be called upon to perform all types of engineer support. Typical assignments for engineer troops located in the service area include—

(1) *Road and bridge maintenance (construction and repair).* In the division service area there will be a continual buildup and replenishment of supplies and equipment. This results in an added amount of traffic on the road network. Since all of our defensive operations are dependent upon the mobility of units and supplies, it is of great importance that the roads and bridges be kept open at all times.

(2) *Division command post.* With the concepts of increased dispersion, a division command post will be faced with the problem of avoiding presenting a profitable target for enemy nuclear weapons. All emplacements must be dispersed, concealed, and sufficiently dug in to prevent excessive damage from nuclear attack. The necessity for alternate com-

mand posts and brigade headquarters will also increase the work load of the engineers appreciably.

(3) *Division artillery positions.* Additional engineer assistance will be required to provide for rapid and distant displacement of artillery units.

(4) *Supply and water points.* The operation of water and supply is the responsibility of the engineer battalion S4, but the engineer companies will assist in site preparation. This will include clearing, construction of access roads, and necessary leveling and excavation to make the sites suitable for planned installations.

(5) *Mine removal.* If the defense is to be undertaken in an area previously occupied by the enemy, minefields will have been breached. As the buildup of the area increases, it may be necessary for engineer units to enter these mined areas and remove or destroy the mines still in place.

(6) *Prisoner-of-war stockades.* The military police will be responsible for the escorting of prisoners to the rear. The engineers will be called upon to construct inclosures to contain these prisoners.

(7) *Air landing facilities.* It will be necessary to prepare landing facilities for helicopters and light aircraft (TM 5–250). These landing areas will be of a pioneer type construction, consisting primarily of clearing sufficient area to receive the aircraft, and limited leveling

and excavation to make the ground trafficable for aircraft. Examples of this type of work include the clearing of brush, trees, or telephone lines from the sides of a road so the road can be used as a landing strip, and the filling of craters or removal of vegetation from an area of sufficient size to allow helicopter landings.

(8) *Preparation of service installations.* Preparation of service installations may require a large portion of the engineer effort. The areas in which it is decided to locate the necessary service installations will include emplacements for signal communication equipment and quartermaster supply. They will also include areas to be used by the medical units to receive mass casualties as the result of nuclear bursts. Ordnance battalion areas will probably also require preparation. In many cases the terrain may provide much of the necessary cover and concealment. When it does not, the engineers will provide recommendations regarding the location of the installation and may even assist in improving the location.

59. Defense Against Nuclear Attack

a. General.

(1) Division headquarters, or brigade headquarters if division headquarters is not functioning, will control the engineer effort in defense against nuclear attacks. A great part of engineer work will be the measures taken to reduce the vulnerability of friendly forces to the

attack and to facilitate their recovery after the attack. These measures include duplication, dispersion, deception, camouflage, and protective construction before a nuclear attack. They include decontamination, area damage control, and reconstruction after the attack. The engineer effort expended on each task should be determined by the environment, the military importance of the installation or facility, the threat, and the active defense effort by other arms. The commander should weigh these measures in deciding on the employment of the engineer units.

(2) Nuclear defense, which includes radiological defense, is defined as the protective measures taken to minimize personnel and materiel damage from nuclear blast and thermal and radiation effects. It is interpreted to include measures such as—

(*a*) Training of organization personnel and the distribution of personnel with special reference to radiological specialists.

(*b*) Preparation and maintenance of fixed and portable structures and equipment.

(*c*) Teaching defense techniques and procedures, including use of detecting equipment; protection or removal of exposed personnel; and decontamination of personnel, equipment, structures, or terrain.

b. Command Responsibilities. The nuclear defense training of the organization and of the individuals in the organization and the protection of the unit against nuclear weapons effects are basic responsibilities of the

command. Some aspects which may be expected to require consideration by unit commanders are discussed in FM's 21–40, 21–41, and 21–48 and in TC 101–1.

c. Before-Burst Operations. The division engineer is responsible for construction of installations required for radiological defense in the division area. He consults the division chemical officer concerning optimum protection to be gained through special types of construction, the location of new shelters, and special command posts. Additional before-burst engineer tasks include the following, as time permits:

(1) Survey area for suitable shelters and sheltered locations.
(2) Disperse unit personnel, equipment, and supplies consistent with operational practicability.
(3) Cover essential equipment and supplies with canvas or other material for protection against contamination.
(4) Select alternate sites for water points to utilize, where possible, underground sources.
(5) Organize unit medical, rescue, and evacuation teams for the battalion.
(6) Select and prepare, in bridging operations, an alternate bridge site for each bridge needed.
(7) Organize a radiological defense warning system for the battalion.
(8) Prepare a radiological defense SOP based on that of the next higher headquarters for the battalion.

d. After-Burst Operations. The engineer mission in case of a nuclear attack is expected to be essentially the same as for other types of attack, but to be complicated

in practice by the destructive effects of nuclear weapons and the additional hazards of residual radiations. Engineer units will have an important part in area damage control operations because of their normal engineer equipment for light and heavy rescue work. Rescue squads will be organized and equipped to remove casualties, render first aid, and salvage damaged materials. Labor and equipment squads will be organized and equipped to clear debris, search for casualties, assist in decontamination, and evacuate materials. The removal of victims from the wreckage of collapsed buildings will often be a task requiring structural knowledge and engineering judgment. After the burst, engineers may be required to—

(1) Perform first aid, rescue, and evacuation tasks.
(2) Prepare personnel and equipment decontamination stations.
(3) Make and post signs for unsafe areas.
(4) Decontaminate essential areas or evacuate to safe areas.
(5) Fight fires.
(6) Clear debris and tree blowdown from essential routes to facilitate relief, supply, and evacuation.
(7) Remove or cover radioactive particles in contaminated areas.
(8) Assist in the extrication of units or elements trapped by blowdown, rubble, and fire which have resulted from nuclear explosions.
(9) Produce a maximum amount of potable water.
(10) Perform other special and general engineer tasks as required.

60. Retrograde Movements

a. General. A retrograde movement is a movement to the rear or away from the enemy. It may be forced by the enemy or it may be voluntary. Retrograde movements are covered by mobile forces of combined arms, which delay and deceive the enemy and prevent interference with the execution of the retrograde plan. Contact with the enemy is maintained by these covering forces, who force the enemy to fight or maneuver for the ground that is vacated. Retrograde movements are made only by order of, or after approval by, higher headquarters and include—

(1) *Withdrawal from action.* This is an operation by which all or part of a deployed force disengages from the enemy to initiate some other action.

(2) *Delaying action.* This is an operation which trades space for time while inflicting punishment on the enemy without becoming decisively engaged in combat.

(3) *Retirement.* This is an operation in which a force moves away from the enemy without direct pressure to avoid an engagement under existing conditions.

b. Purposes. Retrograde movements are made for one or more of the following purposes:

(1) To disengage from combat.

(2) To avoid combat under undesirable conditions.

(3) To draw the enemy into an unfavorable situation.

(4) To gain time without fighting a decisive engagement.

(5) To place the forces involved in a more favorable position in relation to other friendly troops.
(6) To permit the use of elements of the force elsewhere.
(7) To improve troop safety for nuclear weapons employment.

61. Withdrawal from Action

a. Withdrawals from action can be executed either by day or by night. Night withdrawals are favored over daylight withdrawals because they normally preserve freedom of action and facilitate deception. A daylight withdrawal under direct enemy pressure is avoided, if possible, because observed enemy fires may result in heavy casualties and loss of freedom of action.

b. The commander ordering a withdrawal from action designates the location to which the troops will move and the action to be taken after the withdrawal. Withdrawals are normally followed by a defense on another position, a delaying action, or a retirement.

62. Delaying Action

a. General. Delaying action is usually employed by covering forces and other security detachments. It is executed most effectively by highly mobile troops (motorized, mechanized, or air transported) supported by armor, tactical aviation, or nuclear fires. The effective use of obstacles, covered by fire, strongly reinforce the delaying capability. Delaying forces must offer a continued threat of strong opposition to force the enemy to deploy and maneuver. A battle group may conduct a delaying action independently or as a part of a larger delaying force. The echelons of a battle

group delaying position are similar to those used in the position defense, i.e., the security echelon (combat outpost), the forward defense area, and the reserve.

b. Nuclear Warfare. Delaying actions assume increased importance in nuclear warfare. Dispersed formations, emphasis on flexibility of action, reliance on heavy fires, and movement to inflict maximum casualties on the enemy while avoiding close combat are all characteristics of a delaying action. Thus, a unit in a delaying action may be organized like a forward battle group in defense when the division is conducting a mobile defense.

c. Methods of Conducting Delaying Actions.

(1) Delay on a single position.
(2) Delay on successive position.
(3) Delay by alternating forces on successive positions.
(4) Limited offensive action or spoiling attacks to throw the enemy off balance.
(5) A combination of any of the above, using nuclear or nonnuclear fires.

d. Successive Positions. Within the scope of the mission and based on available time and space, the commander determines the duration of the resistance to be made on each successive delaying position. The number of successive positions to be occupied depends on total space available for delay, the terrain characteristics, the enemy situation, and the available delay time as stated in the mission. The successive positions should be far enough apart so that the enemy is forced to displace his artillery for each assault.

e. Characteristics of a Good Delaying Position.

(1) Good observation and long-range fields of fire.
(2) Covered routes of withdrawal.

(3) Obstacles to the front and flank.
(4) Cover and concealment on the position.
(5) A series of parallel ridges across the axis of hostile advance.

f. Conduct of the Delaying Action. As the enemy approaches the delaying position, he is taken under fire at extreme ranges. Every effort is made to inflict casualties on the enemy to force him to mass for an assault. Nuclear strikes are used against the resulting massed targets. The commander of the delaying force must decide, if it appears that his position is going to be overrun, whether to execute a daylight withdrawal to the next rearward position or to attempt to wait for nightfall. During the course of withdrawal, special details execute demolitions (including ADM), activate minefields, and prepare other obstacles as time and materials permit.

63. Retirement

a. General. A retirement is a retrograde movement in which a force withdraws without enemy pressure. A retirement may be made to put extended distance between the defender and the enemy, to reduce friendly supporting distance, to occupy more favorable terrain, to conform to dispositions of a higher command, or to permit employment in another sector. A withdrawal from action may precede a retirement. In a withdrawal from action, the movement becomes a retirement after the main force has broken contact with the enemy and march columns have been formed. A battle group usually executes a retirement as part of a larger force. When it is on an independent mission, it retires in compliance with specific instructions or after completing its mission.

b. Security. Strong mobile advance, rear, and flank guards are required in a retirement. The rear guard is the principal security of each column. Its composition and size depend on the size and imminence of enemy attack. Should the enemy make contact, the rear guard employs delaying action tactics. Air reconnaissance is used to maintain surveillance of leading hostile elements. Combat aviation aids in delaying the pursuing enemy. Artillery air observers are prepared to place long-range fires, including nuclear fires, on enemy forces. The use of Army aircraft facilitates column control. Control of radio traffic is strictly enforced particularly during the initial stages, to preserve secrecy.

c. Conduct of the Retirement. At the designated time, elements of the battle group move into dispersed assembly areas and form rapidly into march columns to begin retirement. Forced marches are often employed to place maximum distance between the enemy and the retiring force. Long marches at night are common.

64. Engineer Support of Other Arms

During retrograde movements, engineers play a vital role in delaying the advance of the enemy and in providing adequate withdrawal routes. Proper coordination and execution of engineer tasks in retrograde movements normally require the attachment of engineer elements to the covering force. The leading elements of the retiring friendly troops must be kept moving to their destination, and the routes must be kept open and clear to allow successive elements to reach their destination. Engineers near the end of the retiring column destroy bridges and culverts, block roads, lay mines, destroy stores, and demolish railways and rolling stock

(fig. 26). The time available and instructions of higher headquarters determine the degree of destruction and the number of obstacles constructed. Major obstacles must receive priority, since their construction leads to the greatest difficulty for the enemy. The engineers work closely with the other elements of the covering force, preparing alternate delaying positions and obstacles for the infantry and antitank units, while moving to the rear in leapfrog fashion.

65. Engineer Duties

The duties of the engineers in a retrograde movement are basically the same as in the defense. Typical duties include—

a. Performing engineer tasks to aid movement of retiring columns.

Figure 26. Engineers prepare a railway bridge for demolition.

b. Participating in denial operations as authorized by higher headquarters.

c. Delaying the enemy by destroying bridges and culverts, blocking roads, demolishing railways, and erecting barriers.

d. Assisting in flank security by preparing demolitions, including atomic demolition munitions, and creating obstacles.

e. Engaging in infantry-type combat.

66. Denial Operations

a. General.

(1) A denial measure is an action to deny the enemy use of space, personnel, or facilities.

(2) The decision on the extent to which denial operations are to include nonmilitary supplies and facilities is a responsibility of the highest military commander in the theater. When the denial policy is established, the detailed planning and execution involve major problems in engineering and logistics. For details, see FM 31–10.

(3) A scorched-earth policy makes an entire area useless to the enemy by the removal or destruction of everything that can in any way aid him. The civilian population of an area in which the scorched-earth policy is to be applied must be evacuated if the area is friendly. A partial-denial operation, less drastic than a scorched-earth policy, is more often employed.

b. Engineer Participation. The division commander is responsible for denial operations within his divisional area. His plan for denial of both military and civilian supplies, equipment, and installations is prepared in ac-

cordance with denial policy from higher headquarters and is distributed to divisional units for execution. The infantry division engineer battalion is especially suitable for executing denial operations and plays a large role in carrying out denial procedures by furnishing technical advice, supervisors, and demolition experts. Extensive use is made of the engineer equipment and demolitions in the removal or destruction of items to be denied to the enemy. Troops of other arms and services are also used extensively in denial operations, usually under engineer supervision. It is a command decision to determine when preliminary work is to be done and when plans are to be executed. A denial operation, to be successful, must be prosecuted ruthlessly.

c. Denial by Removal. Evacuation of materiel, if at all possible, should be accomplished in a denial operation. Destruction is to be effected only as a last resort. Evacuation must be started early and conducted in accordance with prepared priority lists. All available means of labor and transportation must be used to capacity in order to save all possible supplies and equipment.

d. Denial by Destruction. All possible methods of destruction are used. In order that destruction may be executed at the desired time, the personnel who will destroy each item must be designated in advance; the supplies necessary for the destruction must be estimated and assembled at convenient locations; and the circumstances under which the destruction is to take place must be definitely prescribed. If orders for destruction are to be issued, the means of transmission must be provided.

e. Use of Atomic Demolition Munitions (ADM).

(1) ADM may be used for denial operations. Normally, the officer responsible for the execution of a mission requiring an ADM will be the commander of the engineer emplacement and firing unit. The designated commander should be highly trained in all aspects of nuclear weapons operations which are the responsibility of engineer personnel and should be cognizant of the technical phases actually performed by other personnel. He ordinarily directs all operations at the emplacement site, takes emergency action in the event of a change of mission or misfire, and detonates the ADM on order from higher headquarters.

(2) Engineer personnel prepare the emplacement site under the direction of the engineer emplacement site commander. This may include providing appropriate access roads, installing antitank and antipersonnel minefields or other obstacles when ordered, camouflaging the area to avoid disclosure of the operation, providing local security, and providing communication facilities. Engineer personnel install the ADM in the emplacement and complete all preparation of the site with the assistance of other technicians provided for the mission.

Section IV. LOGISTICS

67. Division Engineer Supply

The division engineer is responsible for the engineer supply of the division. He also has command responsi-

bility for the supply of the infantry division engineer battalion. He delegates details for supply operations to the battalion S4. The division engineer supply subsection and the battalion supply subsection and water supply subsection assist the S4 in performing supply operations. The battalion's specific responsibilities to the division are as follows:

a. Class II and Class IV Supplies. Units of the division forward requisitions for class II and class IV supplies to the engineer battalion for editing and consolidating. The engineer battalion makes periodic requisitions on the supply points or depots for consolidated division requirements. The battalion receives, breaks down, and issues engineer class II supplies to other elements of the division. The battalion distributes class IV supplies direct from supply points to the requesting units. This eliminates unnecessary handling of the heavy tonnage items. Whenever possible, the battalion makes distribution of supplies to units within the division. When this is not possible, and transportation is critical, units obtain supplies from a location which the engineer battalion establishes.

b. Repair Parts. The engineer battalion furnishes the division units first and second echelon engineer repair parts in the same way it furnishes class II supplies. The battalion maintains a small stock of selected repair parts to facilitate third echelon maintenance support of engineer equipment within the division.

c. Water Supply. The engineer battalion is responsible for making available a supply of treated water for all purposes to all elements of the infantry division. It is responsible for the installation, operation, and maintenance of water supply equipment (TM 5-295). It

also makes reconnaissance and develops water supply sources.

(1) *Water supply equipment.* Headquarters company of the infantry division engineer battalion contains five water supply equipment sets and enough transportation and water supply specialists and helpers to operate the sets independently. With this equipment, the battalion establishes required water supply points; and the units of the division draw water from the nearest point.

(2) *Control of water supply teams.* As a rule, elements of the infantry division are so widely dispersed that it is impossible for the division engineer to efficiently operate the water supply teams under his direct control. As a result, one water supply team, complete with operating personnel and transportation, is usually attached to each committed battle group or placed in support of it and one is attached to division trains or placed in support of them. If other troops from the infantry division engineer battalion are attached to these units or supporting them, the water supply teams will be attached to these troops. If no other troops are attached to the battle group or division trains, the S4 of the unit to which the water supply team is attached will direct its operations. Usually, only four of the five water supply teams of the battalion are operating at one time. The fifth is held in reserve and is used primarily in forward movement, where it installs an advanced water point while one or another of those in the rear is

removed or turned over to a water supply team of another unit.

(3) *Location and operation of water supply points.* The tactical situation usually dictates the location and hours of operation of water supply points. The commander also considers road nets, parking areas, and overhead cover when he is selecting a site. A water supply point is established within an area as soon as the area is occupied. It is located as centrally as possible within the area. This makes water distribution easier and helps with security. The battalion S4 notifies all units of the location and hours of operation of the water supply points. The infantry units provide transportation for hauling their containers to the water supply points for filling. Normally, units may draw water at any time that the water supply point is in operation; however, if the water supply is limited or the demand excessive, it may be necessary for units to draw water only at scheduled times. Units draw water as soon as possible after the opening of the water supply point so that the water equipment can be dismantled in time to accompany the unit which it is serving. In the absence of orders to the contrary, water points serve all troops requesting water. Rationing of water is a function of command; and the battalion will enforce such limitation of water use only by direct order of higher authority.

(4) *Traffic circulation at water supply points.* The engineer troops operating the water equip-

ment mark the routes leading to the water supply point; and they control traffic at the point.

(5) *Security of water supply points.* If security for a water supply point is not afforded by its location, neighboring units must assure its security. Also, water points will frequently be at a distance from battalion headquarters. In such instances, the water supply team should be attached to a nearby engineer company. The company commander then becomes responsible for the support of the water point and personnel. His responsibilities include accessory construction, security, and rationing.

d. Map Supply. The engineer battalion S2 procures maps and distributes them to units of the division in accordance with general policies drawn up by the division G2. The issue of maps is based on estimates which the division G2 and the division engineer make jointly. The battalion has no map production or reproduction capability. The division requests its maps from army. When the engineer battalion receives the maps, the battalion S2 divides them into unit lots and delivers them to unit S2's by the best available means of transportation.

e. Division Engineer Supply Points.

(1) *Location.* The division engineer supply point is located beyond the range of enemy medium artillery, near the main supply route (MSR). It is centrally located if possible. When the division is in bivouac, the engineer battalion commander normally locates the supply point near headquarters and headquarters com-

pany. Stocks are camouflaged and dispersed. When the division is on the march, the point may move in echelons in order to open a new location before closing the old one. If it moves in one echelon, the supply point during the march consists of the vehicles transporting the supplies.

(2) *Operation.* One man from the division engineer supply section normally operates the supply point because stocks are limited to essential items. More men are assigned if there is a requirement for frequent issues of heavy materials. The battalion commander stocks the supply point initially with supplies which he obtains from army depots and local sources. He may use engineer supplies, such as lumber and road materials, which he finds in the area.

(3) *Issue at supply points.* The engineer battalion issues expendable supplies to troops upon a statement from the commander who draws them. It issues nonexpendable supplies in accordance with approved requisitions on established credits.

f. Supply in Offensive.

(1) *Principal supply items.* In the offensive, the principal items of engineer supply are materials for the repair and maintenance of routes of communication. Large quantities of crushed rock are needed. The battalion procures it locally if possible and places it along the MSR. Road plank for bypassing craters is concentrated in dumps. Bridge timbers

and steel I-beams are located near bridges which may be destroyed by enemy fire or which may need to be strengthened for heavy loads.

(2) *Advance of supply items.* As the attack progresses, dumps are advanced. Captured supplies and local resources, such as rock quarries and standing timber, are exploited to the utmost. As the divisions advance, the army engineer, operating through the army maintenance and supply group, takes over operation of engineer dumps which the divisions relinquish.

g. Supply in Defensive. A wide variety and heavy tonnage of engineer class IV supplies are needed for organizing a defensive position. Among the items are barbed wire and accessories; sandbags; chicken wire and other revetting materials; lumber, nails, and bolts; cement, reinforcing steel, and aggregate; materials for camouflage; and materials needed for work on roads and bridges. The division units pick these items up from the supply points and depots instead of having them delivered to them by the battalion.

h. Supply in Retrograde Movement.

(1) *Base of supplies.* In a retrograde movement, the division is moving toward its base of supplies. During the movement, the division needs explosives or demolitions for the destruction of bridges; materials for the creation of obstacles; items for the temporary repair of roads and bridges used by the marching column; and items for any temporary defensive positions which may be organized. Issue is largely from vehicles. If the retrograde

movement has been anticipated long enough in advance, supplies may be kept loaded in readiness for the movement or prestocked along routes of withdrawal.

(2) *Excess stocks.* When the division commander decides to withdraw, the battalion commander keeps the forward movement of supplies to a minimum and makes every effort to use up existing stocks. Supplies which cannot be used up are evacuated if possible. It if is not possible to evacuate them, the battalion destroys them. The division commander, or higher authority, makes the decision to abandon or destroy supplies. The division engineer requests such a decision if he foresees the need for it.

68. Battalion Maintenance Responsibilities

To take care of its maintenance responsibilities, the infantry division engineer battalion has a battalion maintenance section and a field maintenance section.

a. Battalion Maintenance Section. The battalion maintenance section performs second-echelon maintenance on all ordnance and engineer equipment in headquarters company; and it assists in second-echelon maintenance for all the companies of the battalion. It also issues repair parts and repair supplies to the engineer companies. The section is under the control of the battalion motor officer, who is assisted by a warrant officer. The motor officer advises the battalion commander, the battalion staff, and the engineer company commanders on the technical aspects of automotive and engineer equipment operation and maintenance; directs the operations of the battalion

maintenance section; directs, in coordination with S3, the training for drivers, mechanics, and operators; prepares reports on equipment and supplies; and maintains records on equipment and supplies. The warrant officer, who is assistant motor officer, checks incoming repair work to see if first-echelon maintenance has been performed and to determine the amount of repair work needed. He checks the completed work to be sure that the equipment is in operating condition before it is released from the shop. He also gives technical help to all company motor pool personnel.

b. Field Maintenance Section. The battalion's field maintenance section effects engineer third-echelon maintenance of all engineer equipment in the division. It generally does this work at the worksites. Items which are beyond the capabilities of contact repair are evacuated by the using organization to the supporting engineer field maintenance (direct support) company. Minor items, such as small generators and compressors, may, at the discretion of the engineer inspector, be evacuated to the battalion field maintenance section for repair and return. However, since the battalion field maintenance section does not have evacuation equipment and since it must maintain mobility, it should not build up a bigger backlog than it can move with its organic equipment. The battalion field maintenance section is dependent upon the supporting field maintenance company for repair parts. The battalion field maintenance section maintains continuous liaision with division units and with the supporting engineer field maintenance company in order to speed up the evacuation, repair, and return of items from the field maintenance company to division organizations. The

battalion field maintenance section is under the control of the battalion engineer equipment maintenance officer, who is assisted by the section chief and the engineer equipment repair inspector. Besides controlling all third-echelon engineer maintenance activities in the division, the engineer maintenance equipment officer advises division element commanders and staffs on technical aspects of engineer equipment operation and maintenance; directs the supply and operation of the engineer field maintenance section; advises commanders on equipment operators and other engineer maintenance personnel; and prepares reports and records of engineer equipment and supplies. The engineer equipment repair inspector checks incoming repair work to determine the amount of work to be done; and he checks the completed work to insure that vehicles and equipment are in operating condition before they are released from its shop.

69. Maintenance Responsibilities of Division Engineer

The division engineer advises and assists unit commanders throughout the division in the maintenance of engineer equipment. He makes technical inspections of the equipment and of its maintenance and keeps the division commander and staff advised of the status of the maintenance. He furnishes the division commander information, recommendations, and plans on maintenance; and he makes available to all elements of the division data on engineer equipment, repair parts, and maintenance. He utilizes the battalion engineer equipment maintenance officer in the execution of this responsibility.

70. Battalion Supply

a. The principal functions of the battalion in supply

administration are those of procurement and evacuation. The battalion draws supplies from sources outside and effects distribution within the battalion. It also takes excess or unserviceable supplies from the component units and disposes of them through prescribed channels. The property responsibilities of the commanders are identical with those of commanders at all echelons. These command responsibilities are to insure that all property pertaining to his command is adequatly—

(1) Safeguarded.
(2) Administered.
(3) Accounted for.
(4) Used.

b. The battalion commander carries out his supply responsibilities through the functions of his staff supply officer (S4). The battalion commander discharges his responsibilities by insuring that commanders of subordinate units properly conduct supply functions within their commands. He checks on the efficiency of supply operations through frequent personal inspections and by reports of inspections turned in by his S4. Immediate action to correct supply problems or discrepancies found as a result of inspections is the responsibility of the commander. He must check that required action is taken by his staff to insure that proper corrective actions are accomplished.

c. The battalion supply officer (S4) is responsible for closely supervising the supply activities of all subordinate units and will maintain informal accountability for all military property in the possession of these units. The S4's operations support the tactical plan and are based upon the orders of higher headquarters. He coordinates with the other staff

sections of the battalion, the S4 or G4 of the next higher headquarters, and all supply establishments which are his sources of supply. The primary functions of the S4 include—

(1) Supervision of the battalion supply section of headquarters company.
(2) Liaison with installation supply activities.
(3) Training of supply personnel.
(4) Providing guidance to unit commanders on problems concerning supply.
(5) Informing the battalion commander on the status of supply operations within all elements of the command.
(6) Establishing and maintaining the property books and property records for the battalion and its elements. Duties of the property book officer are normally assigned to the supply warrant officer and include—
   (*a*) Maintaining battalion and installation property books.
   (*b*) Maintaining a transaction register to reflect all supply actions initiated by the battalion.
   (*c*) Initiating all supply requisitions and turn-ins.
   (*d*) Preparing adjustment transactions as required.
   (*e*) Maintaining a file of vouchers to support property book and transaction register entries.

d. The company commander is responsible for the supply and administration of the company and any attached elements. He makes timely requests for supplies and distributes them. The company com-

mander is assisted in these duties by the company officers, the first sergeant, the mess steward, the supply sergeant, and the motor sergeant. The specific responsibilities of a company commander in connection with property administration are quite extensive. He must—

(1) Have in his possession, in serviceable condition, all items authorized his company.

(2) Determine by frequent inspections that all prescribed items of authorized equipment in the possession of officers or enlisted men are on hand and serviceable.

(3) Insure that all personnel, both officers and enlisted, are instructed in the proper methods of use, care, and maintenance of property, and that the instructions are followed.

(4) Maintain individual clothing records, and such other records as are necessary to assure that the status of the property for which he is responsible is accurately reflected at all times.

(5) Obtain acceptable vouchers to cover loss, damage, or destruction to property for which he is responsible, and process these vouchers in accordance with appropriate regulations.

(6) Upon transfer of property responsibility to his successor, take joint inventory, and initiate action to adjust discrepancies.

(7) Where desired, designate one or more authorized representatives to receipt for property in his name. This representative may be any member of his command, commissioned, warrant, or enlisted. The fact, however, that property is receipted for by a

representative of the commander does not in any way reduce his own responsibility for that property.

(8) Assume responsibility for all Government property under his control, whether receipted for or not.

e. The platoon leader is responsible for the supply of his platoon. He inspects the platoon to see that it is completely equipped. He sees to it that any shortages are replaced before the platoon is committed to combat. In combat he sees that the platoon is fed, and supplies and materials are replenished. He reports any shortages to the company commander. He checks on the timely delivery of replacement items.

Section V. COMMUNICATION

71. General

a. To keep pace with the swiftly changing situation and to facilitate the maximum utilization of the engineer battalion in accomplishing its mission, the commander, his staff, and the companies require a highly responsive, flexible, and reliable signal system.

b. Communication is a function of command. Each commander is responsible for the establishment, operation, and maintenance, within his capabilities, of the communication system of his command. Effective communication is essential to the control of the battalion and its elements. The battalion utilizes a combination of radio, wire, visual, sound, and messenger communications to provide as many multiple means of transmitting messages as conditions permit. For a detailed discussion of communications, see FM 7–24.

c. Operation orders contain instructions pertaining to communications. These instructions include such items as the location of the commander or the command post, restrictions on use of certain communication means, allotment of available communication facilities, special prearranged visual or sound signals, pertinent extracts from the SOI of the higher headquarters. Throughout operations, other instructions pertaining to communications are used as required.

72. Responsibilities

a. Effective communication is a result of the joint effort of both units concerned, even though one of these units has primary responsibility for establishing and maintaining communication with the other. In the event of a communication failure, both units concerned take immediate action to locate and eliminate the trouble and continue such action until contact is regained.

b. Headquarters company includes a communication section which is directed by a communication chief. The section operates under the immediate supervision of the communication officer who is a member of the battalion staff. The communication section provides the following services:

(1) Supervises the operation of the battalion communication system.
(2) Installs wire lines to companies and staff sections when time and situation permit.
(3) Operates, when required, the battalion message center and switchboard, and provides messenger service.
(4) Operates panel displays and message pickup facilities.

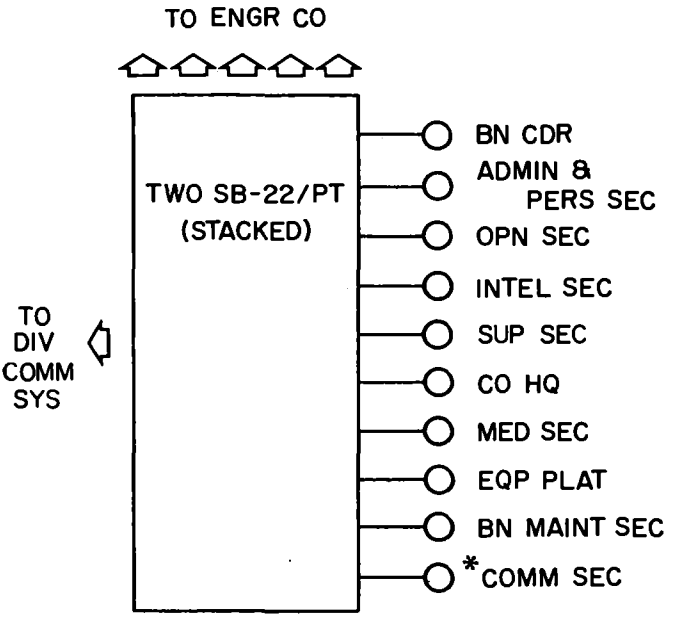
(5) Operates the battalion command net (AM) and the battalion commander's net (FM).
(6) Monitors the division command net (RTT), the division air warning net (AM), and the division commander's net (FM).
(7) Provides second-echelon maintenance on communication equipment of headquarters company and assists the line companies in performance of their second-echelon maintenance.
(8) Provides facilities for encrypting messages.

c. The company commander is responsible for the installation, operation, and maintenance of the company communication system and for its efficient functioning as part of the battalion's or supported unit's system. He insures that his subordinates are properly trained and utilized to assist him in the execution of his communication responsibilities. The intermediate speed radio operator is the principal assistant to the company commander in communication matters. The headquarters platoon of the engineer company is authorized enough men to provide the following:

(1) Second-echelon maintenance on communication equipment of the company.
(2) Supervising the operation of the company communication system.
(3) Installing wire lines to platoon when time and situation permit.
(4) Operating the company message center and switchboard.
(5) Operating the company net (FM) and monitors the battalion commander's net (FM) or the supported organization commander's net (FM) and the division air warning net (AM).

73. Wire Communication

a. Wire communication is used whenever practicable. When distance or other factors prohibit direct wire linkage between the engineer battalion headquarters and subordinate elements, communication is established through the division area communication system. The



○ TELEPHONE TA-264/PT

* TELETYPEWRITER AN/PGC-1

NOTE: NINE TELEPHONES, TA-1/PT, ARE FOR USE AT WORKSITES

Figure 27. Typical wire net, engineer battalion.

battalion headquarters switchboard has a direct tieline from its switchboard to the division forward switchboard that services the battle groups.

b. The battalion lays wire only to those companies which have not been attached to other organizations (fig. 27). Wire communications to these attached companies is established through the division area communication system (FM 24–18).

c. The battalion communication section installs local telephones required for the operation of battalion headquarters.

d. Wire communications are provided at worksites, as required to improve the efficiency of the project and to coordinate the operations of work parties (fig. 28). Units use wire communication to control traffic through minefields, defiles, and construction projects.

74. Radio Communications

a. Wire communication is frequently difficult or impracticable to establish in very fluid or dispersed tactical situations. At such times and during periods of wire outage, radio becomes the primary means. The flexibility of radio communication affords the unit commander the ability to control and coordinate subordinate elements, yet does not restrict these elements in their ability to move (FM 24–20).

b. Radio Nets.

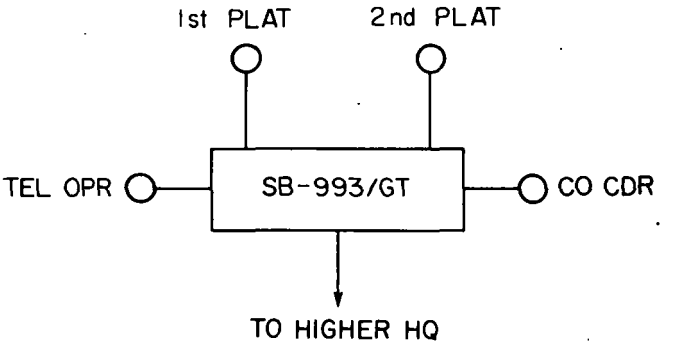
(1) *AM.*

(*a*) *Battalion Command Net (AM).* See figure 29 for personnel who operate in this net.

(*b*) *Division Air Warning Net (AM).* This net is monitored by the communication section of headquarters company and company headquarters of each line company.

(2) *FM.*

(*a*) *Battalion Commander's Net (FM).* Personnel who operate in this net are shown in figure 30. The combat engineer vehicles (CEV) and the armored vehicle launched bridges (AVLB) of headquarters company operate in this net but when attached they operate in supported unit's FM net. During the period a company is supporting another organization, the company commander and the company headquarters radio (AN/VRC–18) normally do not operate in this net but operate in the supported organization commander's net. The



○ TELEPHONE TA-312/PT

NOTE: THREE TELEPHONES, TA-1/PT, ARE FOR USE AT WORKSITES.

Figure 28. Typical wire net, engineer company.

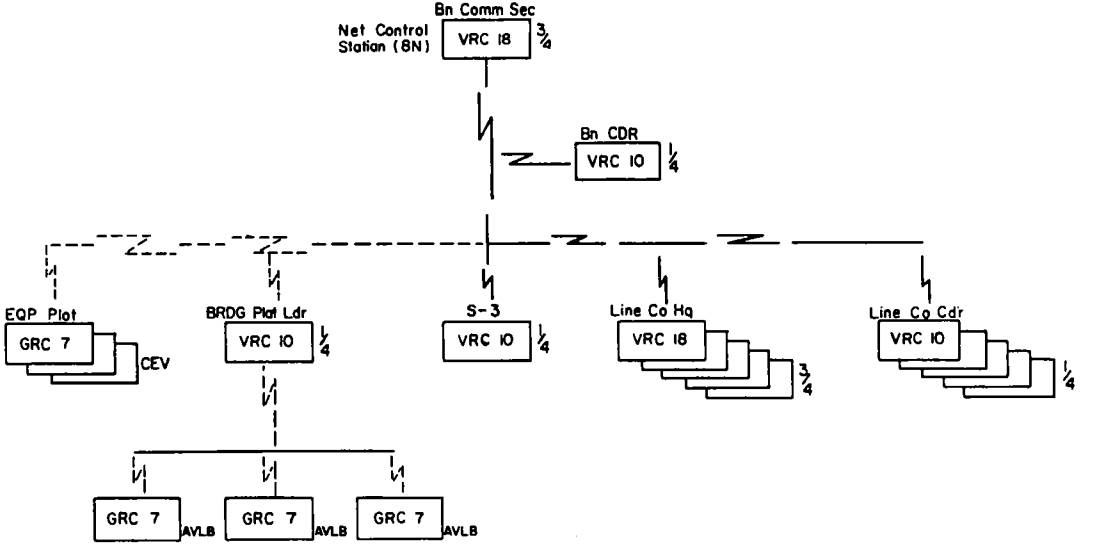


Figure 29. Radio net, engineer battalions.

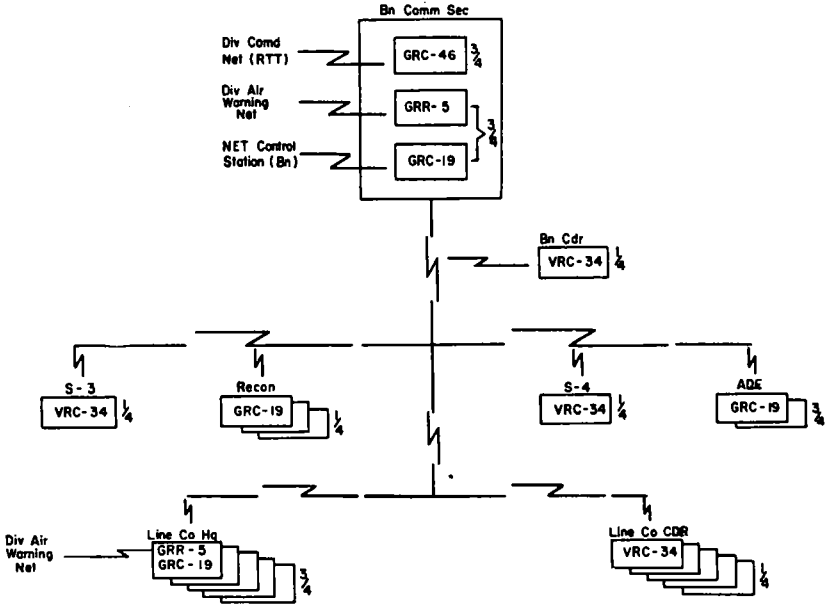


Figure 30. Battalion commander's radio net.

engineer battalion commander can contact the company commander through the AM radio.

(*b*) *Company Command Net (FM).* Personnel who operate in this net are shown in figure 31.

75. Messenger, Visual, and Sound Communication

a. Messenger, visual, and sound are alternate and supplemented methods of communication. They are used whenever the situation warrants and may be especially valuable when radio listening silence is imperative, or when wire communication has been temporarily disrupted or prior to its establishment.

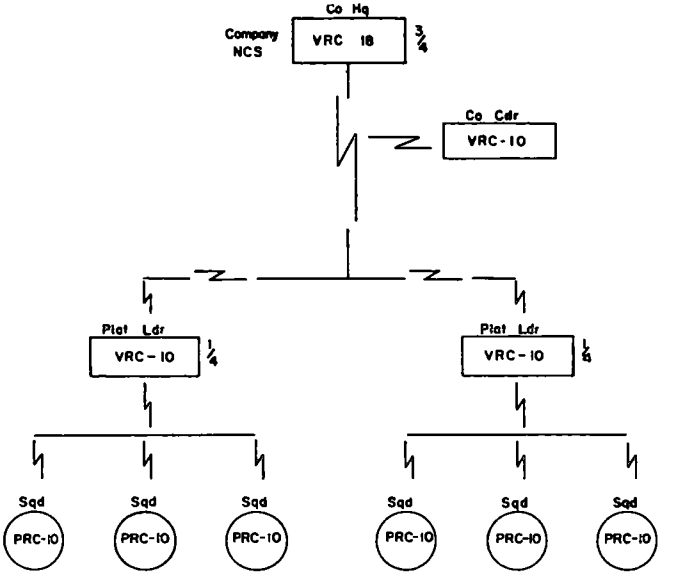


Figure 31. Radio net, engineer company.

b. Messengers are not authorized in the engineer battalion TOE but selected personnel such as vehicle operators are crosstrained as messengers as an additional duty.

c. Visual signalling is accomplished through the use of organic panel sets, pyrotechnics and smoke of various types and colors, arm and hand signals, flashlights, tracer ammunition, and improvised lights and flags. Instructions from higher headquarters normally prescribe the use of panel signals for ground-to-air communication and the use of pyrotechnics or smoke signals (FM 21–60).

d. Sound signals are normally used for alarms and are usually prescribed in the SOP or signal instructions. Such signals may be used to warn of air, CBR, or ground attack or the imminent use of nuclear weapons. Whistles, horns, gongs, small arms, or other noisemakers may be used.

76. Communication with Supporting Engineer Unit

A supporting engineer unit normally establishes and maintains communication with the supported infantry division engineer battalion. This communication is established through either the division or corps area communication system, depending on the location of supporting unit headquarters, or if feasible, it will operate in the infantry division engineer battalion command net.

Section VI. SECURITY

77. Responsibility

The battalion commander is responsible for the security of his battalion and all its units, regardless of

the security furnished by the infantry division. However, in determining the security measures for the battalion, the commander takes into consideration the security measures of the infantry division. If the division has a strong security force, the battalion commander does not establish a large security element.

78. Definition

Security embraces all measures taken by a command to protect itself against enemy interference, surprise, and observation. It may be active or passive. Active security involves firepower and the use of troops. Passive security includes observation, cover, dispersion, and the use of obstacles. The engineer battalion commander employs a combination of the two.

79. Provision

Security detachments are required in all situations. Their mission is to protect against surprise attack and observation by enemy ground and air forces and to maintain freedom of action for the command by gaining the time and space required to make proper dispositions to meet a threat. Since security forces lessen the strength of the main force, they are kept to the minimum strength necessary to accomplish their missions. They should be as mobile as the enemy force with which they may have to deal; and they should have an efficient warning service, including observers and means of communication, to give prompt notice of any enemy threat from the ground or the air.

80. Security During Movement

An engineer company moving on an independent mission provides its own security. It requires security

for the front (advance guards), for the rear (rear guards), for the flanks (flank patrols), during halts (march outposts), and against attacks from the air. Engineer units usually move by motor. When they do, their security detachments are also motorized. The engineer company commander provides all-around security when there is danger of contact with the enemy. The security techniques which he employs depend on the company mission, terrain, time of day, and expected enemy actions.

a. Frontal Security.

(1) Security in front is provided by an advance guard. For a battalion, its strength will normally not exceed a company; for a company, a platoon; and for a platoon, a motor patrol of one or two vehicles.

(2) The mission of the advance guard is to prevent unnecessary delay of the main body and to protect it from surprise and limit enemy observation from the front. An advance guard accomplishes its mission by searching the terrain to the front and on each side of the line of march and by overcoming hostile resistance that is contacted. When contact with the enemy is made, the advance guard will attack aggressively to overcome resistance within its capabilities. If the enemy force is too large for the advance guard to attack, the advance guard will cover the deployment of the main body by maintaining pressure against the enemy.

(3) A company acting as the advance guard for a battalion sends forward a platoon as the

advance party. This platoon, in turn, sends forward a squad as a point. The remainder of the company constitutes the support.

(4) In the smaller units, such as the company and platoon, the advance guard will usually consist of a point and an advance party.

(*a*) The point is the leading element in the movement. It protects the column from enemy surprise. When the point encounters the enemy, it employs rapid fire and maneuver against the enemy force. It maintains contact with the enemy until the advance party has time to deploy.

(*b*) The advance party provides support for the point in the event that the point fails to eliminate the enemy. The advance party takes aggressive action against the enemy and tries to overcome the force so that movement of the main body is not delayed or halted. If the advance party fails to eliminate the enemy force, it maintains contact with it until the support can be committed.

(*c*) The support maintains contact with the advance party and should always be prepared to assist the advance party in moving against the enemy force. If the support is unable to reduce enemy resistance, it immobilizes the enemy by fire and movement until the arrival of the main body.

(5) Distances between the point and the advance party, between the advance party and support, and between the support and main body vary according to the speed of movement

and the terrain. These distances are great enough to allow each succeeding element to deploy without serious interference from the enemy when contact is made. However, these distances are not great enough to prevent each element from rapidly assisting the element in front of it. At high speed, distances are increased; at low speed, they are decreased. Vehicles are spaced at distances of from 50 to 200 yards in order to provide protection against air attack and to maintain uniform speed.

b. Rear Security.

(1) Rear guards are used to protect the rear of a column advancing toward the enemy if an attack or harassing action from the rear is deemed within the enemy capabilities or to protect the rear of a column marching away from the enemy.

(2) A company should adopt a formation similar to that of the advance guard in the reverse order of march. The differences between elements of the support vary with the situation, the terrain, and the visibility; they correspond generally to the distance between elements of the advance guard. When the column halts, the rear support dismounts and forms a march outpost.

(3) When an enemy pursuit is close, elements of the support delay the enemy to permit the next preceding unit to make suitable dispositions. Fire is opened at long range. Usually, elements do not move toward the

enemy to reinforce a lower element. The larger element occupies a delaying position to cover the withdrawal of the smaller element. The element in contact with the enemy then withdraws under the protective fires of the element occupying the delaying position. The rate of retirement is coordinated with the main body.

(4) The rear point stops to fire only when enemy action threatens to interfere with the march. The rear point is not reinforced by other troops. When the rear point withdraws, it uses a route that does not mask the fire of the rear party.

c. Flank Security. In open terrain, flank security of a unit no larger than a company may be sufficiently assured by speed of movement and constant observation to the flanks. This usually will not suffice, however, in heavily wooded, rolling, or mountainous terrain, or where the menace of guerrilla operations exists. Continuous flank patrolling is possible only where a parallel route exists (a condition not usually enjoyed by units of company size), but effective employment can be made of small flank patrols sent out on side roads, commanding ground, and points of observation. Flank security detachments usually are not strong enough to effectively delay the enemy; their mission is to give early warning of enemy activity, hence they must be equipped with adequate communication facilities.

d. Motorized Security Patrols. The motorized security patrol is used for reconnaissance and all types of security operations and particularly as the point of an

advance or rear guard. Motorized patrols are limited in effectiveness by the fact that they are roadbound and easily ambushed and captured or destroyed. Therefore, at least two vehicles, plus any other vehicles required for messengers, are required. An engineer company moving alone normally has enough vehicles, weapons, and men to use more than one vehicle in either its advance or rear security patrol without undue disposition.

81. Security at Halt and in Bivouac

Whenever an engineer unit is at a temporary halt during a march or is in bivouac, it provides its own security. It does this by establishing an outpost system. The outpost's duty is to secure the main body against close observation and surprise by the enemy. It is organized and disposed so that it can deal with a minor enemy threat without disturbing the main body or forcing it to take action; and so that, in case of a major threat, it can at least hold off the enemy until the main body can make preparations for action. The composition of the outpost varies for each situation. The outpost system consists of sentinels, outguards, and visiting patrols. Larger units will find it necessary to employ all of the components of the outpost system. Smaller units generally combine two of these components. Communications is established between all elements of the outpost system and the main body. If the enemy penetrates any portion of the outpost system, the main body takes measures to protect itself. The measures provide for personnel who form a support or reserve force which counters the enemy penetration. All other personnel take action to secure the unit's immediate area. Interior guards, designated from ele-

ments of the main body, continue to carry out their duties within their assigned area. The engineer unit commander, if possible, halts in an area where there are few or no civilians. If this is impossible, all personnel are warned to keep civilians away from the area or not to allow them to enter until they are screened.

a. Battalion Outpost. An engineer unit seldom goes into bivouac as a battalion size unit; but when it does and furnishes its own security, it needs an outpost the size of a company. Ordinarily, one company is assigned for the outpost. The outpost company places outguards, establishes one or more supports, and holds out a reserve.

b. Company and Platoon Outposts. An engineer company operating alone uses one platoon on outpost duty. This platoon may establish a support and a line of outguards. If it has to cover a wide sector, it establishes outguards only. An engineer platoon operating alone seldom uses more than one squad for bivouac security. If an outpost consists only of outguards, the main body functions as their support.

82. Security at Worksites

a. The amount of security the battalion commander furnishes at the worksite depends on the engineer mission, guerrilla activity in the area, the terrain, and the nearness of the enemy. For larger tasks, such as an engineer battalion constructing a road, the infantry division usually provides the security forces. For smaller tasks, such as a company or platoon constructing a bridge, the officer or noncommissioned officer in charge of the construction project provides security with personnel from his unit.

b. In forward areas of the combat zone, the principal types of enemy action which the working parties take security measures against are dismounted patrols, motor or mechanized raids, and air attacks. Near the the rear of the zone, there is less danger of enemy ground action, except guerrilla attacks. Air attacks may occur anywhere in a theater.

c. Enemy ground action can usually be guarded against by careful observation and by small security detachments covering probable avenues of approach. These may be supplemented by readily removable roadblocks, portable wire obstacles, and mines. The engineer officer or noncommissioned officer in charge of the worksite withdraws as few men as possible from work to use for security. However, working parties are always prepared for possible ground raids. They keep their arms close at hand; and they are trained to assemble, with their weapons, under cover when they receive the warning.

d. The engineer officer or noncommissioned officer in charge of working parties prepares for security against air attack by training the party in warning, concealment, dispersion, and fire. He trains the men to identify friendly and enemy aircraft. He posts guards at points of vantage; and he disperses and conceals equipment and vehicles which are not being used. When the size of the party and the size of the jobs justify it, the officer or noncommissioned officer in charge of the worksite has machineguns emplaced so that they can be manned and used against low-flying aircraft. For protection against air attack on a major rear-area project, the engineer officer requests antiaircraft artillery through channels.

83. Security Against Guerrilla Forces

Guerrilla bands usually employ offensive tactics characterized by surprise, mobility, deception, and decentralized operations. The battalion commander insures that all engineer units are briefed on the fighting techniques of suspected guerrilla forces. The precautions and countermeasures which the engineer units use against guerrillas vary with the nature of the threat. At halts and in bivouac, guards are posted at all times, including periods of rest and recreation. Groups of local inhabitants of any considerable size are not allowed near the bivouac unless they are known to be friendly. Local civilians are subjected to rigid security checks before they are allowed to work in engineer installations such as supply points and maintenance shops. Working parties observe security precautions while they are working, resting, and eating, and when they are going to and from the jobs. When a party leaves a task to return to camp, it takes with it all tools, transportation, and readily removable equipment. A party returning to an incompleted task is alert for ambushes and boobytraps; and it gives special attention to the security of arms, ammunition, and other equipment of value to the guerrillas.

84. Engineers With Convoy Security Detachments

a. Lone vehicles and convoys which are not capable of providing their own security are grouped and escorted through danger areas by armed security detachments. These detachments are specially organized and trained to protect convoys from hostile guerrilla actions and may contain elements of armor, infantry, and engineers. The size and composition of a detachment vary with the topography, the capabilities of

hostile guerrilla forces, and the size and composition of the convoy. Traffic through known danger areas is normally controlled by traffic control stations.

b. The engineer element is placed well forward in the column to perform such engineer tasks as minor bridge and road repair, obstacle removal, and detection and removal of mines.

85. Unescorted Convoy Operations

When a convoy is not escorted through a danger area by a convoy security detachment, the parent organization organizes its own convoy security. Part of the available troops are placed well forward in the convoy; and a strong detachment is placed in vehicles that follow the main body by about three minutes. Radio contact is established between the two groups if possible. Fairly fast speed is maintained. Defiles are traversed at high speed. Sharp curves, steep grades, or other areas where low speed is necessary, are reconnoitered by foot troops. At the first indication of ambush while the convoy is in motion, leading vehicles, if the road appears clear, increase their speed to the maximum consistent with safety in an effort to run through the ambush area. Drivers or assistant drivers of vehicles disabled by enemy fire or mines seek to direct their vehicles to the sides or off the roads so as not to block rear vehicles. Troops from vehicles stopped in the ambush area dismount and return fire. Machineguns mounted on vehicles are fired. Troops from vehicles breaking through the ambush dismount and attack back against a flank of the ambush position. The rear guard of the convoy, upon learning that the main body has been ambushed, dismounts and attacks forward against the other flank of the ambush position.

Both attacking groups take care not to fire on each other. If the guerrillas allow the main convoy to pass through and then ambush the rear guard, troops from the main body return and relieve the rear guard by an attack against the flank of the ambush position.

86. Security Against Chemical and Biological Agents

a. Chemical Warfare. The battalion commander is responsible for the security of the engineer battalion and its components against chemical attacks. He establishes a warning service, provides individual gas masks, and arranges for decontaminating equipment and supplies. Sentries are posted upwind to provide warning service, and men work with gas masks close at hand. Noncommissioned officers, using simple procedures and instruments available to an engineer unit, locate and mark contaminated areas after an attack.

b. Biological Warfare. The threat of biological warfare imposes upon all commanders within the division the responsibility for protection of personnel from the effects of this form of attack. Definite information of the employment of biological warfare will probably be disseminated from the infantry division headquarters; but all echelons must be alert to the danger and must promptly report the incidence of unusual diseases. The best local defense against biological warfare is strict enforcement of all preventive medicine measures.

87. Security Against Nuclear Weapons

The principal effect of nuclear warfare on engineer operations is to increase the amount of engineer effort required by the infantry. It also increases the im-

portance of camouflage. The increased distances between units created by nuclear-defense dispersion will increase the employment of barriers. Distances between units necessitate strict enforcement of security measures. The best protection for individuals is the long-standing military practice of digging in. Field fortifications and shelters built according to present design, with added emphasis on overhead cover, provide good protection against other than direct hits and near misses. In addition to the measures available to the individual, the engineer commander must initiate collective defensive measures. Items considered under this heading include alarm systems, unit equipment used for protection or detection, unit decontamination system, and evacuation procedures. Tactical protection is concerned with the measures which the commander employs to minimize the effects of nuclear explosions. Within the limits of his assigned mission, he will rely on maneuver, reconnaissance, and intelligence. Whereas the individual soldier seeks to make his foxhole as secure as possible during his stay in an area, the unit commander must realize that through maneuver he may minimize the vulnerability of his unit to a nuclear attack.

Section VII. INFANTRY-TYPE COMBAT ROLE

88. General

The infantry division engineer battalion, or any element thereof, engages in infantry-type combat operations when—

a. The enemy prevents access to the unit's job site.

b. The enemy attempts to drive the engineer unit from a job site.

c. The enemy prevents delivery of supplies.

d. Enemy action forces an infantry-type combat role. This may develop in several ways.

(1) The unit commander is forced into an infantry-type combat role in order to save the unit.

(2) Enemy action forces the unit to fight in order that the higher command might accomplish its mission.

(3) The major commander has no alternative than to commit the engineer unit because of a desperate situation.

89. Employment

In the event there is a necessity to employ the engineer battalion or elements thereof in an infantry role, the unit must be prepared to accept this mission with the minimum amount of delay. Engineer units should be committed as a unit and not as separate parts of a unit. This allows the commander to preserve unit integrity.

a. Responsibility. The major force commander is responsible for the decision to commit engineer units to an infantry-type combat role, He will commit the engineer unit *only* after careful consideration, as the commitment will reduce the engineer capability. Before he makes his decision, he must consider such factors as—

(1) The seriousness of the situation—will the enemy force be able to seriously affect the command if the engineer unit is not committed?

(2) The loss of engineer support—can the com-

mand afford to lose the engineer support for the time the unit is committed?

(3) Strength of the engineer unit—does the engineer unit have enough personnel to be effectively employed?

(4) Support to the engineer unit—will the mission be of an offensive or defensive nature, and what fire and logistical support can the engineer unit expect to receive from adjacent and higher units in carrying out its mission? Realization of the major differences between an infantry company and an engineer company regarding strength and weapons.

b. Situations for committing Engineer Units in an Infantry-Type Combat Role. There are many situations where the major force commander may commit an engineer unit to this role. Some of the more typical situations are—

(1) An over-extended defensive front.
(2) A sudden enemy penetration or turning movement.
(3) An enemy airdrop or an organized guerrilla activity in a rear area.
(4) A need to relieve a combat force that must be committed to a more decisive combat role elsewhere.

c. Type of Mission. The type of mission that an engineer unit will receive in an infantry role may be limited by its weapons and personnel. Basically, there are two types of roles. These are *offensive* and *defensive.* In either case, consideration must be given to increasing firepower and fire support through attach-

ment of additional heavy weapons units and liaison detachments of artillery and tactical air support.

(1) *Offensive.* The infantry division engineer battalion might receive a mission to aid other combat forces to take a large objective which is vital to the overall operation, or to destroy an enemy stronghold in the division sector, such as a small bypassed enemy unit; but this type of commitment is rare. However, if the need arises, the engineer personnel committed should be properly trained in offensive infantry combat.

(2) *Defensive.* The defensive type mission is the one most commonly assigned to division engineer units. The major force commander should allow time for the engineer unit to prepare for this mission so that the proper type of support can be coordinated and the nonessential personnel and items of equipment can be moved to a rear area where they will not be captured or destroyed by the enemy force. When ample warning time is available to the engineer commander, he prepares his unit for battle in much the same way as another combat force commander.

90. Guides for the Committed Engineer Unit Commander

A definite plan must be established which will enable the organization to move efficiently from the normal engineer-support-type role to an infantry-type role. This plan, a part of the organization's SOP, should be established for each individual unit. The basic parts of the plan should include—

a. Purpose. The purpose of the plan should state the type of infantry mission which could be assigned to the engineer unit.

b. References. The references to be used pertaining to the basic infantry concept of operations for the offensive-type and defensive-type missions.

(1) Appropriate sections of pertinent field manuals and other publications.

(2) FM 7–10, (Rifle Company, Infantry and Airborne Division Battle Groups).

(3) SOP's of higher headquarters.

c. Procedures. The procedures to be followed when the order is given for the engineer unit to prepare for an infantry-type combat role. This section will include the establishment of a forward and a rear echelon of the command. Figures 32, 33, 34, and 35 show typical modifications of the engineer battalion for an infantry combat role.

(1) *The forward echelon.* The forward echelon will consist of enough sections and units to accomplish the mission. Each unit must establish its own number of elements and the number of personnel in these elements. Each unit should include—

(a) Firepower and maneuvering elements—to find, fix, and destroy or reject the enemy.

(*b*) A communication element—to establish communication between all echelons of command.

(*c*) A supply element—to provide the neccessary supplies for the mission.

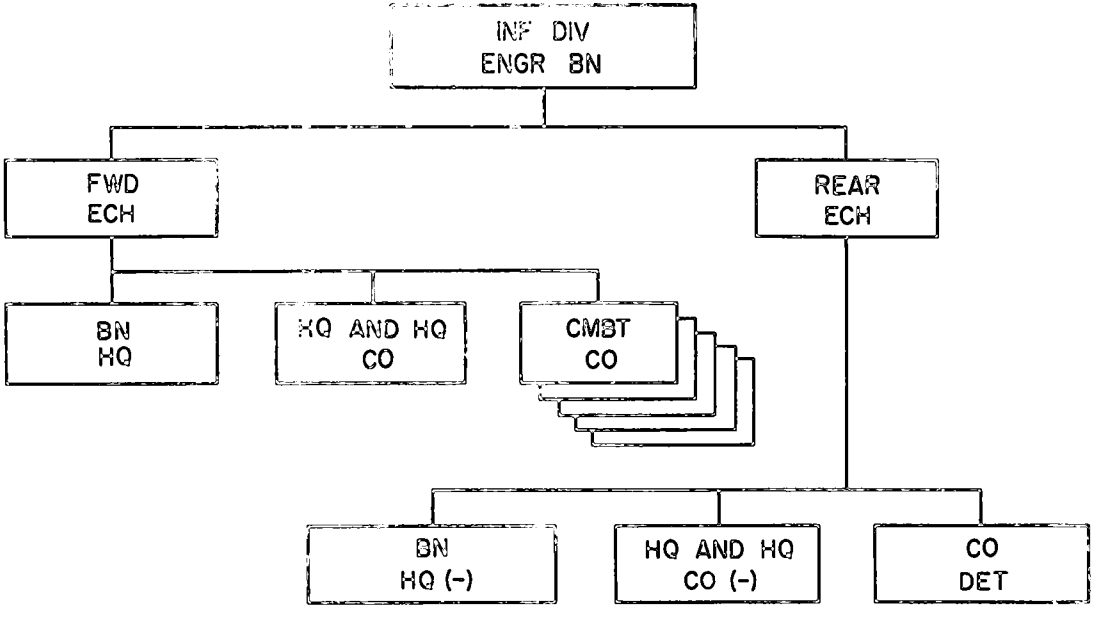


Figure 32. Typical modification of the infantry division engineer battalion.

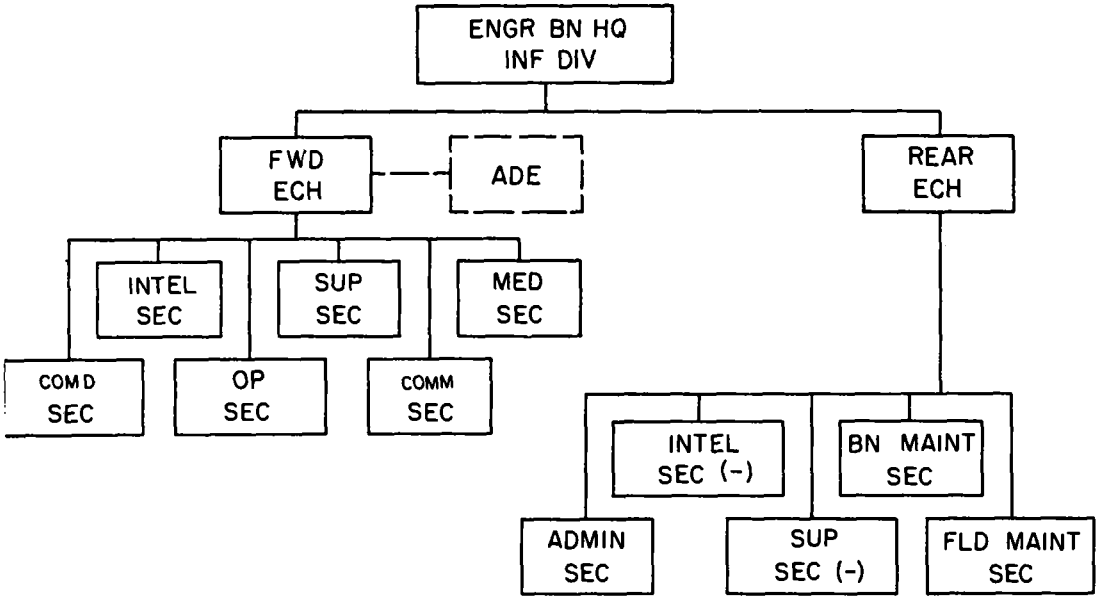


Figure 33. Typical modification of the battalion headquarters, infantry division engineer battalion.

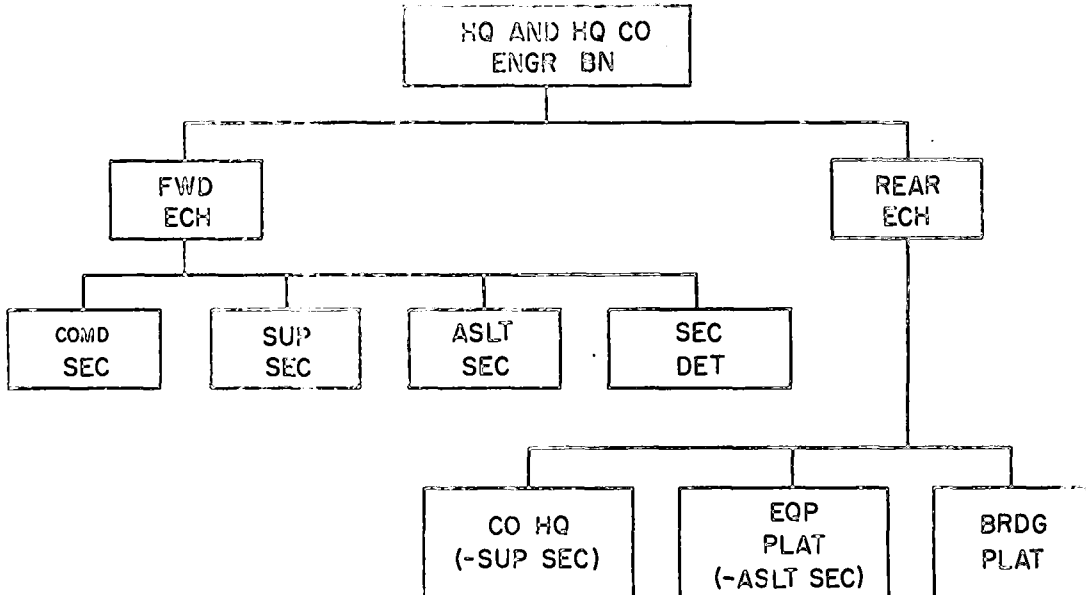


Figure 34. Typical modification of headquarters company, infantry division engineer battalion.

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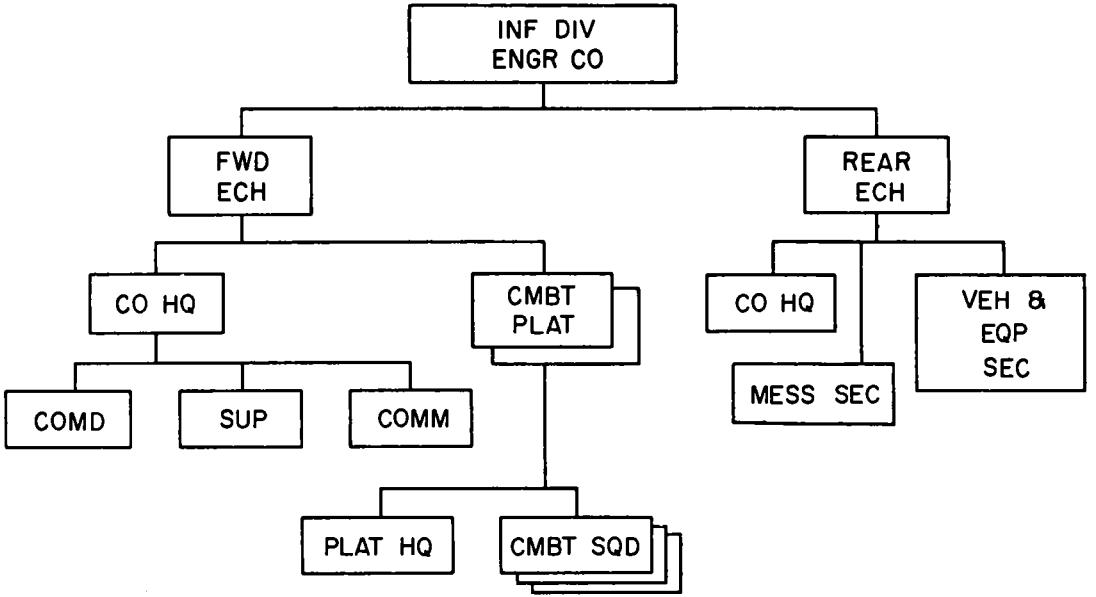

Figure 35. Typical modification of an engineer company, infantry division.

(*d*) A command element—to direct the elements in the accomplishment of their mission. The control of the firepower is established at the command level and enables the commander to effectively employ this combined firepower to influence the action at any time or from any direction.

(2) *The rear echelon.* The rear echelon will include all of the equipment not directly essential to the infantrytype combat mission. Such items as nonessential vehicles and heavy equipment are to move to a rear area designated by the commander. The responsibility for the control of the rear area is to be designated in this section of the SOP.

d. Coordination. This section is to establish the guide for coordination between other units of the command, including adjacent combat units and fire support units.

Section VIII. TRAINING

91. General

a. This section outlines the progressive training, from the basic combat and advanced individual training, through unit training of the infantry division engineer battalion. It should be kept in mind that training never ceases, before, during or after combat, and that the objective of all military training is success in battle. The foundation of this success is a thorough knowledge by every man of the principles of his job, how to apply them, and how to work with others in a team. The ideal unit is well disciplined, thoroughly grounded in its mission, high in morale, and able to act promptly as a team (FM 21–5).

b. The ability to accomplish offensive action is

gained by military training—training that develops the following qualities in soldiers and units: health, strength and endurance; discipline; morale, and esprit de corps; initiative; adaptability; technical proficiency; leadership; teamwork; and tactical proficiency.

c. To develop the above qualities, military training is based on the following concepts:

(1) The dignity of the individual is not violated.

(2) The average man will make an efficient soldier when his training has been properly planned, conducted, and supervised.

(3) The applicatory system of instruction best meets the needs of military training.

(4) Military training progresses for basic to advanced subjects, and from individual to team training.

(5) Skills are acquired through supervised practice.

(6) Responsibility for conducting training is delegated to the unit commander.

92. Responsibility

a. The battalion commander is responsible for training the battalion to perform its primary mission. He plans, directs, conducts, and supervises the training of the battalion. He specifies the training which is to be conducted, within the outline provided by the directives and policies of division headquarters; assigns responsibility for the conduct of the training; insures that the battalion's performance and proficiency standards are in line with the standards of the Department of the Army; and procures and controls the use

of training facilities, aids, and equipment. He issues the training memorandums necessary to implement his training mission.

b. The battalion operations and training officer (S3) prepares a training program and makes recommendations concerning training to the battalion commander. He also establishes battalion-level schools for officers, noncommissioned officers, and specialists. Members of the battalion staff assist the battalion commander in the planning and supervision of training which pertains to their specialized functions.

c. The company commander is responsible for training his company in accordance with battalion training memorandums and policies. Each company commander constantly supervises training of his organization. Administrative work is planned in order to have a minimum adverse effect on the training mission.

93. Training Phases

a. Training in the Army is currently being conducted under the provisions of an army training program (ATP). Normally, the ATP is followed in detail, but at times it becomes necessary for a commander to make modifications so as to conform to conditions of the training situation, or to facilitate the obtainment of the training objective.

b. The ATP training cycle is divided into four phases: basic combat phase; advanced individual phase; unit training phase; and field exercise and maneuver phase. For convenience in planning and to indicate definite stages of progress, the general phases are usually subdivided.

(1) *Basic combat training phase.* The objective of the basic combat training phase is to train

the enlisted man in basic military subjects and the fundamentals of basic infantry combat. In this phase, the recruit is taught how to adapt himself to Army life and learn to live, work with, and understand his fellow soldier. When this phase is completed, he understands why he is to fight; and his physical condition is good enough to enable him to fight effectively. He understands and is able to apply, under simulated or actual combat conditions, the principles of concealment and camouflage, cover, and movement, and is able to provide individual protective actions against aircraft, armor, and dismounted ground attacks. Further, he is able to participate as a member of a patrol or act as an individual scout or observer. He has qualified with his basic weapon, the rifle, and has fired for familiarization the carbine and other weapons, to include the grenades, light machinegun, and rocket launcher.

(2) *Advanced individual phase.* Here the basic soldier improves his basic military skills and becomes branch qualified. The engineer soldier, for example, receives more training in combat tactics and learns the technical skills which qualify him in his military occupational specialty (MOS), such as combat construction specialist, demolition specialist, or water-supply specialist. The training in this phase consists of general training and specialists training, which are interwoven throughout the entire advanced individual phase.

(*a*) *General training.* The objectives of general

training are to train the enlisted man in engineer and additional military subjects which will insure that he is fully capable of performing the basic duties of an engineer soldier in the unit to which assigned; to insure that the enlisted man is able to use and maintain in good repair engineer tools and equipment essential to unit operations; and to insure that the enlisted man is capable of working or fighting for extended periods under adverse conditions. To be more specific, the engineer soldier is able to—

1. Understand nomenclature of engineer tools, equipment, materials, and tasks.
2. Use engineer hand and power tools and equipment sets of the squad and platoon with efficiency, safety, and maintenance in good repair.
3. Perform individual tasks of clearing, grubbing, lashing, rigging, rough carpentry, barbed wire erection, demolition, placing and removal of mines and booby-traps, lifting and carrying heavy loads, and assembly of elements of fixed and floating bridges.
4. Recognize and report engineer information and correctly locate information on maps and aerial photographs.
5. Participate in the attack course and combat in cities.
6. Dig foxholes of sufficient depth to withstand the crushing effect of a tank passing over it or in the near vicinity.

7. Maintain physical condition to march long distances and arrive at destination in condition to perform engineer missions or participate in combat.

(*b*) *Specialist training.* Specialist training prepares personnel to perform the duties of their particular MOS's. For instance, a water-supply specialist will receive training in the characteristics of water and the operation of the diatomite filter, while a clerk-typist will be taught typing and administrative procedures. In our highly specialized Army, practically every soldier has a more or less complex specialty. Most of these specialists can be trained in the unit, but some have to be sent to specialist schools. Since these schools sometimes last longer than the advanced individual phase, this specialist training at times extends into the unit training phase; these specialists often have to make up the general training which they missed while they were at school during the unit training phase. Personnel who complete specialist training before the beginning of the basic unit subphase should be given additional on-the-job training.

(3) *Unit training phase.* After the untrained fillers have become skilled, they are taught to coordinate their efforts toward the accomplishment of the unit's missions. This phase consists of the basic and advanced unit subphases. Most training throughout these

phases is operational—the troops learn by doing.

(a) *Basic.* The basic unit subphase trains the individually skilled soldiers to function progressively as members of squads, sections, platoons, and companies.

(b) *Advanced.* During the advanced unit subphase, companies are trained to function together as battalions; battalions are trained to operate as an infantry division engineer battalion. Combined arms training is achieved by progressively integrating the training of units of varying arms and services throughout these two subphases. For example, each of the companies of an infantry division engineer battalion trains with an infantry division battle group, and perhaps one or more artillery batteries, during this phase. Elements of the bridge platoon and equipment platoon are employed with the line companies. The command, staff, and administrative sections throughout the battalion receive practical and intensive training in their respective fields.

(4) *Field exercise and maneuver phase.* This phase provides for the training of large units on the ground under simulated combat conditions. These maneuvers include many types of units, to insure maximum combined arms training. For instance, in the advanced unit subphase the engineer line company has trained with its parent infantry division engineer battalion and with an infantry

division battle group. During this phase, the entire battalion will work in support of its parent infantry division, and possibly, will be working in conjunction with engineer combat groups which have been placed in support of the division.

c. The training to be conducted and the time to be devoted to training during each of the four phases of training are prescribed in ATP's and subject schedules. Individual and unit proficiency are tested at various stages of the training cycle by the use of Army training tests. A unit normally starts the ATP training cycle as soon as it is activated. It may repeat all or any part of this training at any time that it is judged to have fallen below the level of adequate operational proficiency or when the turnover of personnel makes retraining of a major portion of the unit necessary.

94. Post-ATP Training Cycle

There are no formal phases prescribed for the post-ATP training cycle. The nature of this training depends upon the mission assigned to the unit. The training may consist of perfecting the skills, techniques, and tactics learned during the ATP training cycle, training for special operations, or essential training for a current mission. Certain mandatory subjects, such as physical training and dismounted drill ceremonies, will be continued as prescribed. Units that have the mission of maintaining or increasing their state of operational readiness normally undergo training paralleling the advanced individual, unit, and maneuver phases of the ATP training cycle on an annual basis.

95. Concurrent Training

To make training more realistic and effective, arbi-

trary boundaries between training phases must be avoided. Each subject is related to other subjects, and all subjects are integrated into the team mission. This entails, to some degree, conducting basic and advanced individual, specialist, and unit training concurrently. Reviews of basic subjects are incorporated regularly in the progressive training phases. In many technical exercises, tactical requirements are included, such as providing security for bridge construction projects, and the protection of working parties and obstacles from both ground and air attack. Throughout all phases of training, and particularly during unit training and field exercise, initiative and a sense of responsibility must be developed in officers, noncommissioned officers, and others who show potential leadership ability. Each commander includes leadership exercises in all training phases, particularly during periods of tactical and technical training. Command is decentralized, and interference with subordinate commanders is kept to a minimum.

96. Training of Other Arms and Services

The engineer battalion is sometimes called upon to conduct a demonstration of mine laying, mine clearing, or bridge construction for nonengineer troops of the division. Such demonstrations are usually staged by squads or platoons. The battalion frequently furnishes individual instructors in engineer subjects for the training of other troops. Subjects taught include mine warfare, use of explosives, camouflage, rigging, field fortifications, and bridge and road building expedients. Instructors are usually selected from the officers or key noncommissioned officers of the line companies (FM 21–6).

CHAPTER 7

ENGINEER PLATOON, INFANTRY BATTLE GROUP

Section I. GENERAL

97. Introduction

Though the engineer platoon is organic to the infantry battle group, it is frequently placed in support or under operational control of the supporting engineer company of the engineer battalion. Because of this flexibility in employment, the engineer platoon is being discussed in a separate chapter rather than under the operations of the infantry division engineer battalion.

98. Mission

The mission of the engineer platoon is to increase the combat effectiveness of the battle group by performing general engineer duties. It may also engage in infantry-type combat.

99. Organization

The engineer platoon consists of a platoon headquarters and three engineer squads. The platoon is identical to the platoon in the line companies of the infantry division engineer battalion. For the detailed organization of the platoon, see TOE 7–12.

100. Major Items of Equipment

a. Major items of equipment authorized the platoon headquarters include carpenter and pioneer tool kits, a portable electric pioneer outfit, a wheeled scoop

4-in-1 bucket loader, a demolition set, and a dump truck.

b. Major items of equipment within the squads include carpenter and pioneer tool kits, chain saws, demolition sets, and dump trucks.

101. Mobility

The engineer platoon is 100 percent mobile with its organic transportation. It is also air-transportable.

102. Assignment

The engineer platoon is organic to the infantry battle group; however, it may be placed in support of the engineer company, or attached to it, when the company is in support of a battle group.

103. Capabilities

a. The engineer platoon is capable of performing the following engineer duties:

(1) Repairing and improving roads and bridges.
(2) Constructing field fortifications that require special equipment or training.
(3) Installing and recording minefields; performing minefield reconnaissance; supervising breaching or removal of friendly or enemy minefields and obstacles; and providing engineer advice and assistance in the construction of phony minefields and phony emplacements.
(4) Preparing and placing demolition charges to support rifle elements in destroying or reducing enemy fortifications.
(5) Assisting in the removal of obstacles created by nuclear explosion. The obstacles consist

of tree blown down, displaced enemy or friendly mines, and other obstructions in the path of advance.

(6) Neutralizing or removing minor obstacles by using handplaced demolition charges or organic construction equipment and handtools.

(7) Performing a variety of engineer tasks with its organic earth moving equipment and power tools.

(8) Furnishing its own local security.

(9) Engaging in infantry-type combat.

b. The platoon is not capable of sustained operations away from the parent company unless it is attached to another unit for rations and supplies.

c. When an engineer company is not in support of or attached to the battle group, the engineer platoon leader serves as a special staff officer, advising the commander on engineer matters. See also FM 7–21.

104. Training

The platoon leader, who is an engineer officer, is responsible for the training of his platoon. So far as possible the training should be integrated with that of the engineer battalion and companies and supervised by the engineer staff. One method of keeping the platoon leader and key NCO's familiar with current doctrine is to rotate them in and out of the battalion. Whenever battle group training involves a direct support or attached engineer company, the battle group platoon training should be integrated with that of the engineer company. The platoon leader and key NCO's may assist in training infantry in the operation of the basic engineer tools and equipment available to the infantry.

105. Communications

Two radios, one AN/VRC–18 and one AN/PRC–10, are assigned to the platoon headquarters. The AN/VRC–18 places the platoon in the battle group net, and AN/PRC–10 may be utilized by a squad which is not under the immediate control of the platoon or it may be used by the platoon to operate in the supporting engineer company's net or the net of a supported element of the battle group. One TA–312/PT telephone set is assigned to the platoon for use in the battle group wire net.

Section II. EMPLOYMENT

106. Principles of Employment

The following principles are considered when missions are assigned to the engineer platoon.

a. Unity of Command. Unit integrity should be maintained, if possible. The platoon is trained as a team, and it performs best when it is operating as a team. The battle group commander or the supporting engineer company commander assigns tasks to the platoon leader and gives him the authority to accomplish these tasks by the most advantageous use of the varied skills of the platoon personnel.

b. Supervision. The platoon leader supervises the platoon's activities. Since members of the platoon have specialized skills, the platoon leader should employ them in an advisory capacity.

c. Directed Effort. Maximum engineer effort within the battle group is obtained by careful assignment of tasks to the engineer platoon with priorities for completion. Standard operating procedure for the platoon consists of prior planning, organization of working

parties, and procurement of standard and expedient materials.

d. Working Reserve. Elements of the platoon which are not committed to performing a specified task maintain tools and equipment and perform general engineer tasks in the battle group area.

107. Methods of Employment

a. When an engineer company from the infantry division engineer battalion is supporting the battle group, the engineer company commander advises the battle group commander on the employment of the platoon; but the battle group commander makes the decision. He may use any of the following four methods for the platoon's employment;

(1) *General support.* In general support, the platoon, or a portion of it, under control of the battle group commander, supports the efforts of the whole battle group.

(2) *Direct support.* In direct support, the platoon, or a portion of it, supports the efforts of a specific portion of the battle group. The supported unit does not command the platoon or any of its elements, but it has priority on its support.

(3) *Attachment.* When it is not practical, because of distance or the tactical situation, for the battle group commander to control the platoon, it is attached to a specific element of the battle group. When unity of engineer effort is desired, the platoon is attached to an attached engineer company from the infantry division engineer battalion.

(4) *Attachment for operational control.* The pla-

toon is most effectively employed when it is placed under the operational control of a divisional engineer company in direct support of the battle group. This provides for better overall coordination and supervision of the engineer effort. It also provides a means for the battle group engineer platoon leader to obtain additional technical assistance, heavy equipment and operators, bridging material, logistical support, and engineer staff planning.

b. The tactical employment of the platoon is affected by the dispersion and rapid movement of the infantry battle group in nuclear warfare. However, the mobility of the platoon enables it to move rapidly to any part of the axis-of-advance or zone-of-action to assist in maintaining the force of the attack.

c. When a friendly nuclear explosion precedes the attack, the engineer platoon normally occupies a position with the assault elements of the battle group.

d. After the nuclear explosion, the engineer platoon moves with the leading elements of the battle group in order to assist in the removal of obstacles created by the explosion.

108. Defense

a. In the defense, the efforts of the engineer platoon are concentrated on tasks of construction or destruction which will impede the mobility of the attacker. In addition, the platoon may furnish technical advisers to other units in the battle group to assist them in organizing the ground, recording minefields, preparing obstacles, and constructing field fortifications.

b. In a defensive situation, the platoon is normally employed in a general support role or attached, for

operational control, to the supporting divisional engineer company.

109. Retrograde

a. The principal mission of the platoon in a retrograde operation is to assist in the preparation of obstacles to impede the advance of the enemy.

b. When the battle group is conducting a night withdrawal, all or a portion of the platoon remains with the detachments left in contact. Any portion of the platoon not remaining with the detachments left in contact withdraws with the main body to the new defensive position.

c. When the battle group is conducting a daylight withdrawal, the engineer platoon supports the infantry units in contact.

d. In a retrograde situation, the platoon is normally attached to the supporting divisional engineer company.

APPENDIX I

REFERENCES

1. DA Pamphlets

DA Pam 108–1 Index of Army Motion Pictures, Film Strips, Slides, and Phono-Recordings

DA Pam 310-series

DA Pam 750–1 Preventive Maintenance Guide for Commanders

2. Army Regulations and Special Regulations

AR 30–11 Food Program

AR 65–75 Unit Mail Service

AR 220–60 Battalions, Battle Groups, Squadrons; General Provisions

AR 220–70 Companies; General Provisions

AR 220–346 Journals and Journal Files

AR 320–5 Dictionary of United States Army Terms

AR 320–50 Authorized Abbreviations and Brevity Code

AR 335–50 Strength Accountability

AR 350–1 Army Training Policies

AR 380–5 Safeguarding Defense Information

AR 611–201 Manual of Enlisted Military Occupational Specialities

AR 611–202 Manual of Enlisted Military Occupational Specialties (Classified) (U)

AR 711–16 Stock Control—Installation Stock Control and Supply Procedures

AR 735–5	General Principles and Policies of Property Accountability
AR 735–35	Property Accountability Supply Procedures for TOE Units, Organization and Non-TOE Activities
SR 605–105–5	Commissioned and Warrant Officer Personnel Military Occupational Specialties
SR 605–105–6	Commissioned and Warrant Officer Personnel Military Occupational Specialties (Classified Series) (U)

3. Field Manuals

FM 3–5	Tactics and Techniques of Chemical, Biological, and Radiological (CBR) Warfare
FM 3–50	Chemical Smoke Generator Battalion and Chemical Smoke Generator Company
FM 5–1	Engineer Troop Organization and Operations
FM 5–15	Field Fortifications
FM 5–20	Camouflage, Basic Principles of Field Camouflage
FM 5–25	Explosives and Demolitions
FM 5–26	Employment of Atomic Demolition Munitions (ADM) (U)
FM 5–30	Engineer Intelligence
FM 5–34	Engineer Field Data
FM 5–35	Engineers' Reference and Logistical Data
FM 5–36	Route Reconnaissance and Classification

FM 7–10	Rifle Company, Infantry and Airborne Division Battle Groups
FM 7–21	Headquarters and Headquarters Company, Infantry Division Battle Group
FM 7–24	Communication in Infantry and Airborne Divisions
FM 7–40	Infantry and Airborne Division Battle Groups
FM 7–100	Infantry Division
FM 17–1	Armor Operations, Small Units
FM 17–35	Armored Calvary Units, Armored and Infantry Division
FM 20–32	Land Mine Warfare
FM 21–5	Military Training
FM 21–6	Techniques of Military Instruction
FM 21–10	Military Sanitation
FM 21–26	Map Reading
FM 21–30	Military Symbols
FM 21–40	Small Unit Procedures in Atomic, Biological, and Chemical Warfare
FM 21–41	Soldier's Handbook for Nuclear, Biological, and Chemical Warfare
Fm 21–48	CBR Training Exercises
FM 21–60	Visual Signals
FM 22–5	Drills and Ceremonies
FM 24–18	Field Radio Techniques
FM 24–20	Field Wire Techniques
FM 25–10	Motor Transportation, Operations
FM 30–5	Combat Intelligence
FM 30–10	Terrain Intelligence
FM 31–10	Barriers and Denial Operations

FM 31–15	Operations Against Airborne Attack, Guerrilla Action, and Infiltration
FM 31–21	Guerrilla Warfare and Special Forces Operations
FM 31–25	Desert Operations
FM 31–50	Combat in Fortified Areas and Towns
FM 31–60	River-Crossing Operations
FM 31–71	Northern Operations
FM 31–72	Mountain Operations
FM 57–30	Airborne Operations
FM 72–20	Jungle Operations
FM 100–5	Field Service Regulations, Operations
FM 100–10	Field Service Regulations, Administration
FM 101–5	Staff Officer's Field Manual, Staff Organization and Procedure
FM 101–10	Staff Officers' Field Manual; Organization, Technical, and Logistical Data

4. Technical Manuals

TM 3–200	Capabilities and Employment of Toxic Chemicals
TM 5–210	Military River Crossing Equipment
TM 5–220	Passage of Obstacles Other Than Minefields
TM 5–250	Roads and Airfields
TM 5–252	Use of Road and Airfield Construction Equipment
TM 5–260	Principles of Bridging
TM 5–271	Light Stream-Crossing Equipment
TM 5–295	Military Water Supply
TM 5–302	Construction in the Theater of Operations

TM 5–320	Military Fixed Bridging
TM 5–461	Engineer Hand Tools
TM 5–505	Maintenance of Engineer Equipment
TM 5–624	Roads, Runways and Miscellaneous Pavements; Repairs and Utilities
TM 5–725	Rigging
TM 9–2810	Tactical Motor Vehicle Preventive Maintenance, Supply, Inspection, and Training Procedures
TM 57–210	Air Movement of Troops and Equipment

5. Technical Bulletins

TB 5–271–1	Bridge, Floating, Raft Section, Light Tactical

6. Training Circulars

TC 5–2	Employment of Mobile Assault Bridging
TC 101–1	Prediction of Fallout and Radiological Monitoring and Survey

7. Army Training Tests

ATT 5–15–1	Infantry Division Engineer Battalion

8. Army Training Programs

ATP 5–300	Engineer Combat Battalions

APPENDIX II

RECOMMENDED OUTLINE FOR SOP

STANDING OPERATING PROCEDURE—
INFANTRY DIVISION ENGINEER BATTALION

Hq, Engr Bn (Inf Div)
APO ____, US Army
1 January 19____

Section I. GENERAL

1. APPLICATION (to operations, relation to prior SOP's, lower units to conform)
2. PURPOSE
3. REFERENCES (AR's, SR's, FM's, TM's)
4. RESPONSIBILITY FOR SOP (preparation, changes, and revisions)
5. EFFECTIVE DATE

Section II. COMMAND, STAFF, AND LIAISON

6. ORGANIZATION
   a. Normal.
   b. Special Internal Attachments and Organization.
   c. Normal and Special External Attachment and Support (task forces, etc.).
7. COMMAND POSTS
   a. Normal Location (in relation to next higher headquarters).
   b. Reporting Change of Location (coordinates and time).
   c. Forward CP's.
      (1) When (situation for which required).

(2) How (organized).
(3) Personnel and equipment.

d. Assumption of Command (in the event of nuclear attack).

8. STAFF DUTIES

a. Special or Additional Duties to Those in FM's 5–132 and 101–5.

b. Duties of Such Other Important Special Staff Officers as the Commander Desires to Prescribe (paragraph for each).

9. LIAISON (FM's 5–132 and 101–5)

a. Responsibilities for Liaison (with next higher, lower, and adjacent units).

b. Duties of Liaison Officers.

Section III. ADMINISTRATION

10. GENERAL (Channels) FM 100–10

11. REPORTS

a. Routine.

b. Special.

c. Information Concerning Submission of Reports. Annex B.

(1) Title and reports control symbol.
(2) Form of report.
(3) Date due.
(4) Number of copies.
(5) Negative report required or permissible.

12. PROMOTIONS (policies)

a. Officer (AR's in 140- and 605-series).

b. Enlisted (AR 624–200).

c. Battlefield.

13. COURTS-MARTIAL (MCM, US 1951)

a. Local Jurisdiction.

b. Procedure for Submitting Charges.

14. MAIL (AR's 340–15, 341–10, and 341–50)
    a. Handling of Official Mail.
    b. Handling of Personal Mail.
15. LEAVES AND PASSES (AR's 630–5, 630–10, and 630–20)
    a. Policy of Command (frequency, conduct, VD policies, and so forth).
    b. Authority to Grant.
16. JOURNALS AND HISTORY (AR's 220–345, 220–346, and SR 600–730–5)
    a. Responsibility for Unit Journal and History.
    b. Maintenance of Staff-Section Journals.
17. DISTRIBUTION OF MILITARY PUBLICATIONS (AR 310–1)
18. HANDLING PRISONERS OF WAR (DA Pam 20–151)
    a. Reference to FM 27–10.
    b. Special Instructions for Capturing Units.
19. AWARDS AND DECORATIONS (AR's 220–105, and 672–5–1)
    a. Channels.
    b. Forms.
    c. Presentation.
20. ORDERS (FM 101–5)
    a. Combat Orders.
    b. Memoranda of Combat Orders to S3.
21. BILLETS AND BIVOUACS
    a. Billeting Policies (occupation and vacating).
    b. Billeting Party (organization and duties).

Section IV. RECONNAISSANCE, INTELLIGENCE, AND COUNTERINTELLIGENCE

22. RECONNAISSANCE
    a. Reconnaissance—a Continuing Function.

b. Essential Elements of Engineer Information.

23. ENGINEER INTELLIGENCE (FM 5–30)
    a. Evaluation.
    b. Preparation of Reports.
    c. Dissemination.
24. COMBAT INTELLIGENCE (FM 30–5)
    a. Definition of "Spot Report."
    b. "Spot Reports" Required.
        (1) Initial contact with enemy.
        (2) Marked changes in enemy disposition or situation.
        (3) Attack by armored, aircraft, or airborne forces.
        (4) New units identified.
        (5) Enemy strength, composition, and movement.
        (6) Location of enemy installations.
        (7) Use of chemicals or new weapons.
        (8) New enemy materials or equipment.
25. COUNTERINTELLIGENCE
    a. Mail Censorship.
    b. Blackout Discipline.
    c. Extent of Information Given, If Captured.
    d. Signs and Countersigns.
    e. Destruction of Classified Material.
    f. Civilian Control.
    g. Secrecy Discipline.
    h. Information to Press Representatives.

Section V. OPERATIONS

26. ORDERS (FM 101–5)
    a. Fragmentary Orders.
    b. Written Orders.
    c. Use of Overlays, Tables, and Charts.

27. SECURITY. ANNEX C.
    a. Responsibilities of Battalion in Rear Area.
    b. Responsibilities of Unit Commander.
28. COMBAT
    a. Modification for Infantry-Type Combat. Annex D.
    b. Responsibility for Contact.
    c. Coordination of Request for Fire Support and Tactical Air Support.
    d. Spot Reports.
    e. Situation Reports.
    f. Minefields.
    g. CBR Warfare. Annex E.
        (1) Defensive.
        (2) Offensive.
    h. Smoke.
        (1) Request for use.
        (2) Coordination.
    i. Defense Against Air Attack.
    j. Employment of ADM. Annex F.
    k. Bomb and Shell Disposal.
29. MOVEMENT
    a. General.
        (1) What constitutes a convoy.
        (2) Required road clearances.
        (3) Requests for augmented transportation.
        (4) Loading plan. Annex G.
    b. General Responsibilities.
        (1) S–1.
            (a) Coordination with civil and military police.
            (b) Commands quartering party.
        (2) S–2.
            (a) Security of bivouac and halt areas.

(*b*) Reconnaissance of route.
(*c*) Posting of road guides.

(3) S–3.
(*a*) Warning order.
(*b*) Movement order.
(*c*) Selects routes.
(*d*) Arranges for road clearances.

(4) S–4.
(*a*) Arranges for augmented transportation.
(*b*) Responsible for traffic planning.

(5) Motor officer.
Responsible for maintenance.

(6) Company commanders.
(*a*) Prepares company loading plan.
(*b*) Furnishes S–3 with lists of vehicles, equipment, and materials.
(*c*) Conducts necessary training for movement.
(*d*) Polices area.

c. Motor Movement. Annex H.
d. Rail Movement. Annex I.
e. Alert Plans.
(1) Unit plans.
(2) Alert rosters.

Section VI. LOGISTICS

30. CLASS I SUPPLY
a. Ration Pickup
b. Daily Ration Return and Ration Cycle.
c. Reserve Rations Carried.
(1) By Unit.
(2) By Individual.

d. Responsibility for Attached Units.

31. WATER SUPPLY
    a. Authorized Sources.
    b. Purification by Expedient Methods.
    c. Water Economy.
32. CLASS II AND CLASS IV SUPPLY
    a. Requisition Days for Various Services.
    b. Pickup Procedure.
    c. Salvage Turn-In Procedure.
    d. Droppage by "Battle Loss Certificate."
    e. Basic Loads. Annex J.
33. CLASS III SUPPLY
    a. Method of Supply.
    b. Fuel sources.
34. CLASS V SUPPLY
    a. Method of Requisitioning.
    b. Forms Used and Certificates Required.
    c. Basic Load. Annex J.
    d. Salvage.
35. MAINTENANCE OF VEHICLES AND EQUIPMENT (TM's 5–505, 9–8000, and 38–660–1).
    a. Echelons of Maintenance.
    b. Maintenance Officer's Responsibilities.
    c. Forms Used.
    d. Priorities.
36. REPAIR PARTS
    a. Method of Requisitioning Engineer and Ordnance.
    b. Maintenance of Stock Levels.
    c. Inspections for Maintenance and Stock Levels.
    d. Parts and Equipment Records.
37. EVACUATION OF VEHICLES AND EQUIPMENT
    a. Engineer Channels.

b. Ordnance Channels.

38. PURCHASE AND PROCUREMENT (AR's 700–34 and 37–107)
    a. Designation and Duties of P&C Officer.
    b. Procedures and Channels.
    c. Items and Services (include real estate).
39. EVACUATION AND HOSPITALIZATION. ANNEX K.

Section VII. COMMUNICATION

40. COMMUNICATION BETWEEN UNITS (TM 24–210 and FM 24–20)
    a. Radio. Annex L.
    b. Wire (FM 24–20). Annex M.
    c. Responsibility for Installation.
    d. Visual (FM 21–60).
41. COMMUNICATION PROCEDURES
    a. Radiotelephone Voice Procedure (FM's 24–18 and 24–20).
    b. Signal Security.
    c. Citation of SOI and SSI of Higher Headquarters.
42. MAINTENANCE RESPONSIBILITIES OF COMMUNICATION OFFICER (FM's 100–11 and 7–25)

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Annex: A—References (omitted)
B—Reports (omitted)
C—Security
D—Modification for Infantry-Type Combat
E—CBR Warfare
F—Employment of ADM

G—Loading Plan (omitted)
H—Motor Movement
I—Rail Movement
J—Basic Loads (omitted)
K—Evacuation and Hospitalization (omitted)
L—Radio Communication Nets (omitted)
M—Wire Communication Nets (omitted)

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ANNEX C (SECURITY) TO SOP, Hq, ENGINEER BATTALION, INFANTRY DIVISION

1. GENERAL SECURITY
   Policy and Responsibilities (FM 26–5 and AR's 345–15 and 380–5).
2. SECURITY DURING MOVEMENT
   a. Air Guards.
   b. Manning of Vehicular Weapons.
   c. Camouflage During Halts.
   d. Advance, Flank, and Rear Guards.
   e. Action in Case of Attack.
      (1) Air.
      (2) Mechanized.
      (3) Nuclear, biological, and chemical.
3. SECURITY IN BIVOUAC (FM's 5–20, 5–31, 7–10, and 31–21)
   a. Camouflage.
   b. Mines and Boobytraps.
   c. Placement of Weapons.
      (1) Air Attack.
      (2) Mechanized.
      (3) Nuclear, biological, and chemical.
   d. Joint Security.
   e. Security Plans.
   f. Sentry Posts and Outposts.
4. REAR-AREA OBSERVATION (FM's 7–10 and 7–40)
   a. Formation of Rear-Area Observation Groups.
   b. Selection of Rear-Area Observation Posts.
   c. Twenty-Four-Hour Manning Posts.
   d. Observation of Rear Areas When Required.
   e. Communications for Observation Posts.

5. SECURITY OF WORKING PARTIES
   a. Responsibility.
   b. Camouflage of Equipment.
   c. Combat Readiness.
6. SECURITY OF WARNING SIGNALS
   a. Air Attack.
   b. Airborne Attack.
   c. Mechanized Attack.
   d. Gas Attack.
   e. Nuclear, Biological, and Chemical Attack.
7. FIRE SAFETY AND FIREFIGHTING (AR 420–90)
   a. Plan (general).
   b. Fire Personnel and Duties.
   c. Safety Rules (motor pools, kitchens, and so forth).
8. ALERT PLANS
   a. Unit Plans.
   b. Alert Roster.

ANNEX D (MODIFICATION FOR INFANTRY TYPE COMBAT) TO SOP, HQ, ... ENGINEER BATTALION, INFANTRY DIVISION

1. GENERAL
   a. Requirement.
   b. Prior Approval of the Battalion Commander.
2. DESIGNATION OF FORWARD ECHELON
   a. Personnel.
   b. Equipment.
3. DESIGNATION OF REAR ECHELON
   a. Personnel.
   b. Equipment.
4. SUPPLY
   a. Ammunition.
   b. Unit Trains.
5. COMMUNICATION
6. MEDICAL EVACUATION (FM's 7–30 and 8–35)
7. STATEMENT OF EFFECT ON NORMAL MISSION

ANNEX E (CBR) TO SOP, HQ, ---------- ENGINEER BATTALION, INFANTRY DIVISION

1. GENERAL
   a. Purpose.
   b. Subordinate Units To Issue SOP's To Conform.
2. REFERENCES
   a. FM 21–40 (other pertinent doctrinal sources).
   b. Division Training Directive No. ----------
   c. Orders, SOP's, and Annexes.
3. ORGANIZATION
   a. Command Staff Structure.
   b. Specialists.
4. RESPONSIBILITIES
   a. Individual.
   b. Company Commanders.
      (1) Plans.
      (2) Proficiency of unit personnel.
      (3) Safeguarding and processing of captured enemy CBR personnel and equipment.
      (4) Unit CBR equipment.
      (5) First and second echelon decontamination.
   c. Large-Scale Decontamination (see Engineer Annex, Inf Div SOP No. ----------).
5. DISPERSION
   Guide to Minimum Yardage Maintained Between Various Type Sections.
6. CBR ALARMS
   a. General Alarm. Attack Considered Imminent.
   b. Actual Attack.
   c. All Clear.
7. PROCEDURE IN CASE OF CBR ATTACK
   a. Action Prior to Attack.
   b. Action During Attack.
      (1) Protective equipment.

(2) Cover and movement.
(3) Unit protective measures.
(4) Coordination between higher, lower, and adjacent units.

c. Action After Attack.
(1) All-clear signal.
(2) Continuation of mission.
(3) Resupply of protective equipment and material.
(4) Marking and reporting of contaminated areas.
(5) Decontamination.

8. PROTECTION
a. Individual.
b. Unit.
c. Tactical.

9. SUPPLY
a. Emergency Requisitions.
b. Authorized Levels of CBR Equipment.

10. TRAINING
See Division Training Directive No. _____.

ANNEX F (EMPLOYMENT OF ADM) TO SOP, HQ, ---------- ENGINEER BATTALION, INFANTRY DIVISION

1. PUBLICATIONS

a. Listing. An annex or appendix should include those TM's, FM's, ordnance technical information letters, etc., deemed necessary for the assemblymen to scan, read, or study. This listing, however, should not act as a substitution for the complete statement of policy within the SOP.

b. Responsibility.

(1) Preparation and review of local SOP's.

(2) Requisition of pertinent publications.

(3) Posting of all changes.

(4) Storage of material (see also under security).

c. Requisitioning Procedure.

d. Unsatisfactory Reports (UR) (refer to TM 39–5–8).

(1) Preparation.

(2) Submission.

(3) Recording file.

2. SECURITY

a. Statement of Policy.

(1) Importance.

(2) Possible consequences of violations.

(3) Responsibilities.

b. Document Control Procedure.

c. Training Item Control.

d. Classified Study Procedure.

e. Clearances. An annex or appendix should include the clearance of officers and their enlisted men.

f. Access List. An annex or appendix should include the current access list to the exclusion area.

3. SAFETY

a. General Safety Procedures.

(1) A statement allowing no deviation from the standard checklist as prepared by battalion, group, division, or army, dependent on theater policy.

(2) Applicable safety requirements deemed necessary, such as preventive maintenance, driver training, preoperation checks, etc.

b. Electrical Safety Requirements (if desired).

c. Explosive Safety Requirements (load tests, etc.).

d. Nuclear Safety Requirements (rubber gloves, three-foot rule, etc.).

4. TRANSPORTATION

a. Convoy Composition. Allow for three or four different types of compositions. Do not attempt to standardize beyond minimum requirements.

b. Courier Officer.

(1) Clearance.

(2) Responsibility.

c. Convoy Officer (ranking man).

(1) Clearance.

(2) Responsibilities.

(3) May also be courier officer under most conditions (check with higher headquarters).

d. Drivers.

(1) Clearance (if required).

(2) Responsibilities.

e. Guards.

(1) Escort guards (access to equipment).

(*a*) Clearance—secret, restricted data.

(*b*) Responsibility.

(2) Convoy guards (no access to equipment).

(*a*) Clearance—confidential.

(*b*) Responsibility.
(*c*) Tactical security (infantry, armor, etc.).
(*d*) Standby reserve force.
(*e*) Radio requirements (communication).

5. EMERGENCY DESTRUCTION
a. Nuclear Components.
b. Nonnuclear Components.
c. Priority of Denial.

6. STORAGE AND MAINTENANCE
a. Permanent Requirements (if applicable).
b. Temporary Storage Requirements.
(1) Physical storage.
(2) Security requirements (see also under security).

c. Schedule for Storage Inspection (SI) and Storage Monitoring (SM)—Ordnance Responsibility.

d. Schedule for Partial Storage Monitoring (PSM)—Unit Responsibility.

7. SUPPLY
a. Requisition Procedure.
b. Property Accountability.
c. Equipment Maintenance Records (when applicable).

8. TRAINING
a. Classified Training Requirements—ADM training should be conducted each week in the following type breakdown:
(1) Assembly procedures.
(Normal—4-hr block per month.)
(Minimum—4-hr block every other month.)
(This phase is entirely dependent upon the availability of training items.)
(2) Field wire installation.

(Normal—4 hr per month.)
(Minimum—2 hr per month.)

(3) Manual study, UR preparation, review of new material.
(Normal—4 hr per month.)
(Minimum—2 hr per month.)

(4) Support training.
(Normal—4 hr per month.)
(Minimum—2 hr per month.)
(*a*) Convoy procedure.
(*b*) Site preparation.
(*c*) Team organization.
(*d*) Review of the SOP.

b. Training Records.

c. Testing Procedure (written, performance, IG, and/or ATT).

d. Security Training.

9. CONCEPT OF THE OPERATION

a. Team Leaders (by position ex co, plat ldr, plat sgt, sqd ldr, etc.).

(1) Officer in charge of the operation.
(2) OIC or NCDIC of the security force.
(3) OIC or NCDIC of the field wire installation.
(4) OIC or NCOIC of the assembly operation.
(5) OIC or NCOIC of the site preparation crew (emplacement and command sites).

b. Composition and Duties.

(1) Security force.
(2) Field wire installation (include a field wire checklist as an annex or appendix).
(3) Assembly operation (include an assembly checklist as an annex or appendix).
(4) Site preparation crew (emplacement and command site).

c. Coordination of Activities. Include a sample operations order and outline the progression of the operation as to the order of activities from pickup to detonation or abort (change of mission).

d. Change of Mission (abort procedures).

(1) Team composition and duties.

(*a*) Abort team.

(*b*) Security force.

(*c*) Cleanup crew (if applicable).

(2) Coordination of activities. Outline the procedure desired if the mission should change.

ANNEX H (MOTOR MOVEMENT) TO SOP, HQ _____ ENGINEER BATTALION,

INFANTRY DIVISION

1. GENERAL (FM 25–10, AR 55-355, and division SOP and march orders).
   a. Preparation of Vehicles.
   b. Motor Marches.
      (1) Strip maps.
      (2) Route reconnaissance.
      (3) Messing and refueling.
      (4) Night marches.
      (5) Composition of march units and serials.
      (6) Distances to be maintained.
      (7) Speeds and rate of march.
      (8) Posting of traffic guards during halts.
   c. Conduct of Personnel During Movement.
   d. Maintenance on Marches and Movements.
2. VEHICLE AND EQUIPMENT REGULATIONS
   a. Motor Pool (AR's 700–2300–1 and 53–5).
      (1) Dispatch.
      (2) Service.
      (3) Maintenance.
   b. Regulations for Administrative Vehicles.

ANNEX I (RAIL MOVEMENT) TO SOP, HQ, ---------- ENGINEER BATTALION,

INFANTRY DIVISION

1. ACTION BY S1
   a. Movement Policy.
   b. Troop Lists.
   c. Designation of Movement Control Personnel.
2. ACTION BY S2
   a. Railroad Reconnaissance Report.
   b. Security.
3. ACTION BY S3
   a. Determine Rolling-Stock Requirements.
   b. Coordinate Loading Plans.
   c. Prepare Loading Schedule and Designate Areas.
4. ACTION BY S4
   a. Initiate Transportation Requests.
   b. Troop and Guard Mess.
   c. Procurement of Blocking and Dunnage.
   d. Prepare Shipping Documents.

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[AG 353 (30 Mar 60)]

By Order of *Wilber M. Brucker*, Secretary of the Army:

L. L. LEMNITZER,
General, United States Army,
Chief of Staff.

Official:

R. V. LEE,
Major General, United States Army,
The Adjutant General.

Distribution:
Active Army:

Tech Stf, DA (1) except CofEngrs (25)	Gen Dep(2)
Engr Bd (10)	Engr Dep (2)
OS Maj Comd (20)	Div Engr (2)
MDW (10)	Dist Engr (2)
Armies (30) except First US Army (35)	USA Corps (Res) (4)
Div (5)	Army Advisor Gp, NGUS (2)
Engr Bde (2)	Units org under fol TOE:
Engr Gp (4)	5–17 (10)
Engr Bn (15)	5–36 (5)
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NG: State AG (3) units same as Active Army except allowance is one copy for each unit.
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For explanation of abbreviations used, see AR 320–50.